SONY

CCD COLOR VIDEO CAMERA MODULE

# XC-999/999P

RGB ADAPTOR

# CMA-999/999P

SPECIAL MOUNT LENS
**VCL-03S12XM**

SPECIAL MOUNT LENS
**VCL-06S12XM**

SPECIAL MOUNT LENS
**VCL-7S12XEA**

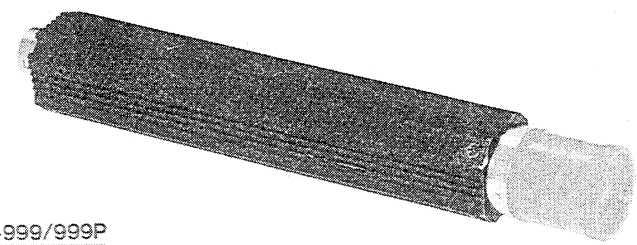
SPECIAL MOUNT LENS
**VCL-12S12XM**

S12 C MOUNT ADAPTOR
**LO-999CMT**

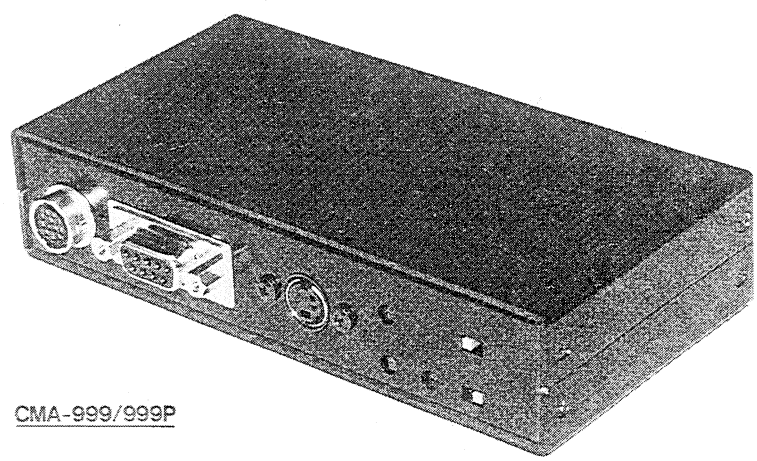
EXTENSION RING KIT
**LO-999ERK**

PLUG
**PC-XC03**

CAMERA CABLE
**CCXC-12P05S**
**CCXC-12P05D**
**CCXC-12P05R**
**CCXC-12P05U**
**CCXC-12P05L**



XC-999/999P



CMA-999/999P

SERVICE MANUAL

XCM-999

## WARNING

**To prevent fire or shock hazard, do not expose the unit to rain or moisture.**

This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

**For the customers in the USA**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that any changes or modifications not expressly approved in this manual could void your authority to operate this equipment.

The shielded interface cable recommended in this manual must be used with this equipment in order to comply with the limits for a digital device pursuant to Subpart B of Part 15 of FCC Rules.

**For the customers in Canada**

This apparatus complies with the Class A limits for radio noise emissions set out in Radio Interference Regulations.

**Pour les utilisateurs au Canada**

Cet appareil est conforme aux normes Classe A pour bruits radioélectriques, spécifiés dans le Règlement sur le brouillage radioélectrique.

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Sony Corporation

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# SECTION 1
# OPERATION

## 1-1. FEATURES AND NOTES ON USE

### FEATURES

The XC-999/999P is a ultra-small CCD color video camera module which uses a CCD (Charge Coupled Device), a solid stage image sensor.

**Ultra-small size and lightweight**
The camera is so small and light that you can install it anywhere: even in locations where conventional video cameras cannot be installed.

**High resolution**
The CCD used in the camera has either 768 x 494 (XC-999) or 752 x 582 (XC-999P) picture elements, ensuring a high resolution image.

**High Sensitivity**
A HYPER HAD sensor provides the camera with high sensitivity and less smear, and it is possible to shoot under low light condition.

**Four white balance adjustment mode**
You can choose the white balance mode according to the lighting conditions by setting the WHITE BALANCE switches.

**Electronic shutter with wide range of operating speeds**
The camera's electronic shutter has four speeds: OFF (1/60 s (XC-999) or 1/50 s (XC-999P)), FLICKERLESS (1/100 s for XC-999 or 1/120 s for XC-999P) and 1/1000 s.
By setting the switches to the CCD IRIS position, the camera automatically adjusts the shutter speed according to amount of incident light, thus regulating the level of the video signal.

### NOTES ON USE

**Handling of the unit**
Be careful not to spill water or other liquids on the unit, or to get combustible or metallic material inside the body. If used with foreign matter inside, the camera is liable to fail, or be a cause of fire or electric shock.

**Operating and storage locations**
Avoid shooting a very bright object (such as light fittings) for an extended period. Avoid operating or storing the unit in the following locations.

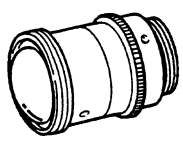
- Extremely hot or cold places (operating temperature 0°C to 40°C; 32°F to 104°F)
- Damp or dusty places
- Locations exposed to rain
- Locations subject to strong vibration
- Close to generators of powerful electromagnetic radiation, such as radio or TV transmitters.

**Handling of the lens**
As the lens could damaged if not attached properly, make sure to see the section "Attaching the lens" on page 1-8(E) before attaching it.

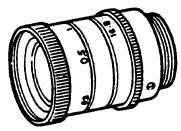
**Care of the unit**
- Remove dust or dirt from the surface of the lens or optical filter with a blower.
- Use a dry, soft cloth to clean the body. If it is very dirty, use a cloth dampened with a small quantity of neutral detergent, then wipe dry. Avoid the use of volatile solvents such as thinners, alcohol, benzene, and insecticides. They may damage the surface finish or impair the operation of the camera.

## 1-2. SPECIAL ACCESSORIES (NOT SUPPLIED)

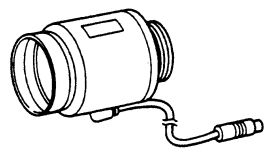
You can build a high performance system by using the following XC-999/999P accessories.



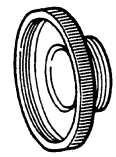
VCL-03S12XM (f = 3.5mm)
special MT lens



VCL-06S12XM (f = 6mm)
VCL-12S12XM (f = 12mm)
special MT lens



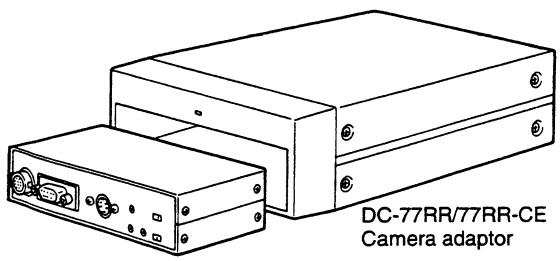
VCL-7S12XEA (f = 7mm)
special MT lens



LO-999CMT
C-mount adaptor

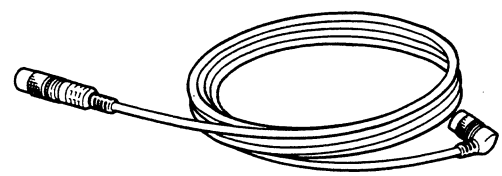
LO-999ERK
extension ring kit

PC-XC03 auto iris lens plug



DC-77RR/77RR-CE
Camera adaptor

CMA-999/999P
RGB adaptor



CCXC-12P05S/D/R/U/L shielded type
connecting cable

This section briefly explains the functions of these accessories.

**CMA-999/999P RGB adaptor**
The RGB adaptor provides the following functions.
- RGB output function (D-SUB 9-pin) and Y (luminance)/C (chrominance) output (Y/C separated output connector) function
- Genlock function
- Exposure time control function

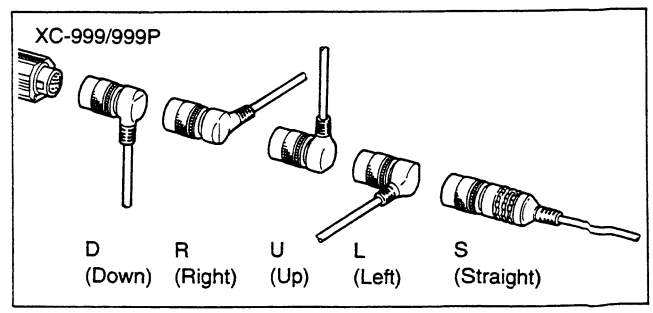
You can use this adaptor together with either of the DC-77RR/77RR-CE or the JB-77.

**VCL-12S12XM special MT lens (f=12mm)**
**VCL-06S12XM special MT lens (f=6mm)**
**VCL-03S12XM special MT lens (f=3.5mm)**
Manual iris lens specially designed for use with the XC-999/999P.

**LO-999CMT C-mount adaptor**
Lens mount adaptor designed for mounting conventional C mount lens onto the XC-999/999P.

**LO-999 ERK extension ring kit**
Extension ring kit designed for the XC-999/999P Color video camera module.

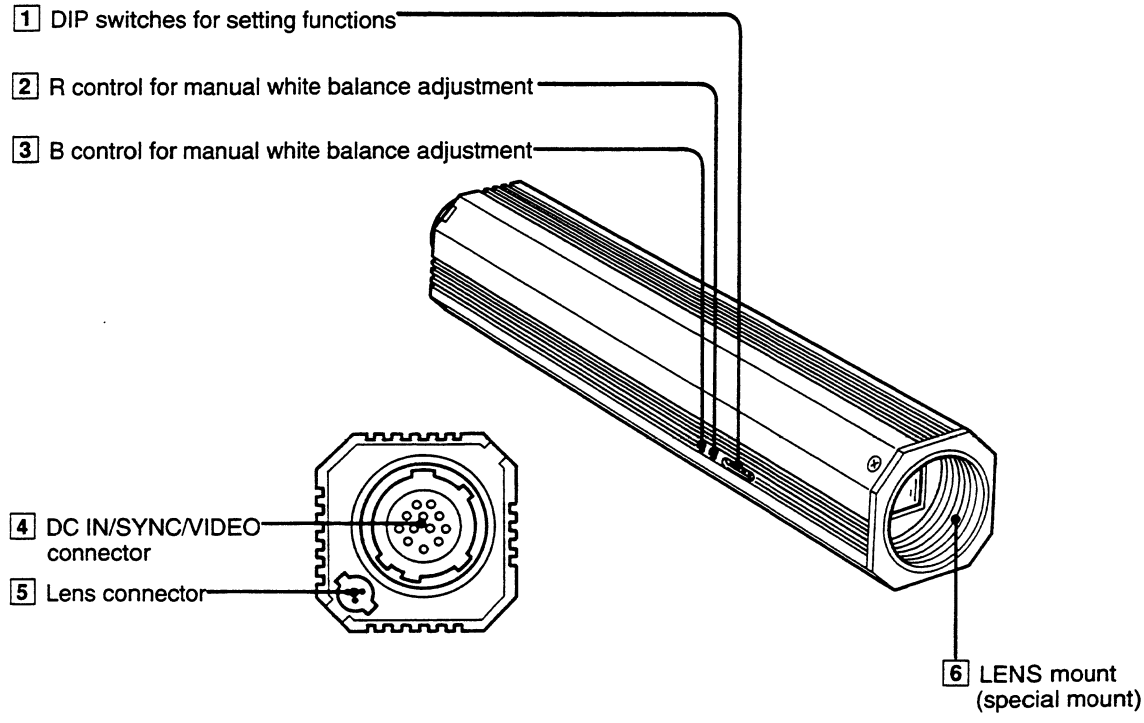
**CCXC-12P05S/D/R/U/L connecting cables**
The cable end of the camera side connector have different angles as illustrated. Note that you can not change the connector end angle.



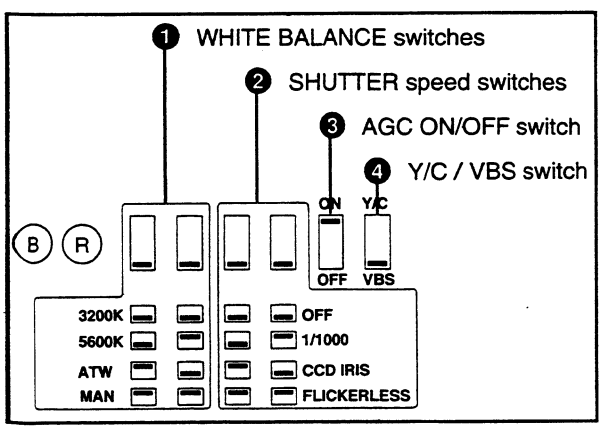

**PC-XC03 auto iris lens plug**
Plug for auto iris lens

## 1-3. LOCATION AND FUNCTION OF PARTS

### XC-999/999P CCD Color Video Camera Module


1 DIP switches for setting functions
2 R control for manual white balance adjustment
3 B control for manual white balance adjustment
4 DC IN/SYNC/VIDEO connector
5 Lens connector
6 LENS mount (special mount)

**1 DIP switches for setting functions**




**1 WHITE BALANCE switches**

Select the white balance setting according to the lighting conditions.

**3200K** (fixed): For indoor shooting under incandescent light. (factory setting)

**5600K** (fixed): For outdoor shooting on sunny days.

**ATW** (auto tracing white balance): The white balance is adjusted according to the color temperature transition of the subject. This mode is suitable for shooting with variable lighting.

**MAN** (manual): Select this position when you want to adjust the red color with the R control and the blue color with the B control.

**2 SHUTTER speed switches**

Set the SHUTTER speed switches to select the desired shutter speed. Set the switches to the CCD IRIS position to use the CCD iris function.

**OFF:** 1/60 s (XC-999) or 1/50 s (XC-999P) (factory setting)

**1/1000:** 1/1000 s

**FLICKERLESS**: 1/100 s (XC-999) or 1/120 s (XC-999P)

**CCD IRIS:** Selects CCD IRIS mode. Select this position when using the exposure time control functions of the RGB adaptor. By setting the switches to this CCD IRIS position, the camera automatically adjusts the shutter speed according to the incident light.

**Note**

When shooting under the light of fluorescent lamps on a 50 Hz (XC-999) and 60 Hz (XC-999P) power supply, particularly at 1/1000 speed or in the CCD IRIS mode, the picture may flicker. If that is the case, set the shutter speed to the FLICKERLESS position.

**3 AGC (auto gain control) ON/OFF switch**

**ON:** Auto gain control (factory setting)

**OFF:** 0 dB

**4 Y/C / VBS switch**

**Y/C:** Select this position to output the Y/C separated signal from the DC IN/SYNC/VIDEO connector.

**VBS:** Select this position to output the VBS signal from the DC IN/SYNC/VIDEO connector. (factory setting)

**2 R control for manual white balance adjustment**
This control is effective when the WHITE BALANCE switches are set to MAN. Adjust the red color by turning the control with the supplied screw driver.

**3 B control for manual white balance adjustment**
This control is effective when the WHITE BALANCE switches are set to MAN. Adjust the blue color by turning the control with the supplied screw driver.

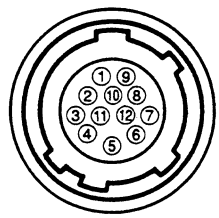
**4 DC IN/SYNC/VIDEO connector (Multi 12-pin)**
This connector inputs DC 12 V power and outputs the video signal when the CCXC-12P05S/D/R/U/L camera cable is connected. The camera is synchronized with the external sync signal when receiving an external sync signal (VS, HD/VD) by connecting the signal generator.

**5 Lens connector (3-pin)**
Connect the auto iris lens plug.

**6 LENS mount (special mount)**
Usable lenses are as follows.
Special lens (not supplied)
- VCL-12S12XM special MT lens (f=12mm)
- VCL-06S12XM special MT lens (f=6mm)

C mount lens (not supplied)
The LO-999CMT C-mount adaptor is needed to attach the C mount lens.

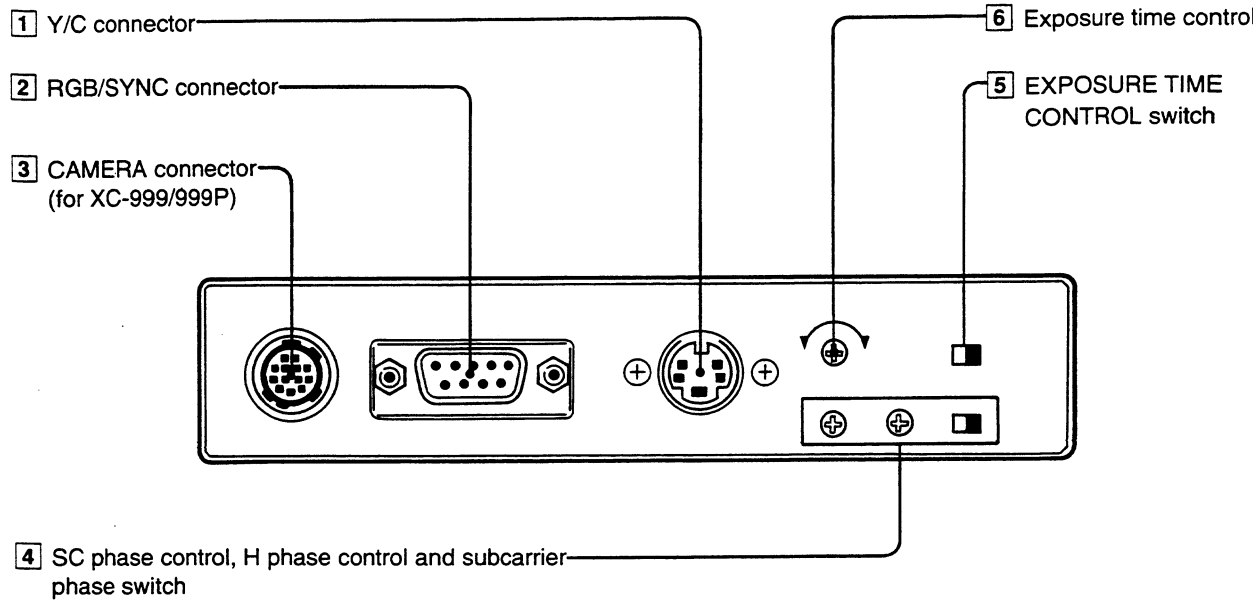
**Pin assignment of DC IN/SYNC/VIDEO connector**




| Signal / Pin. No. | Sync Signals | | |
|---|---|---|---|
| | External sync signal | | Internal sync signal |
| | HD, VD | VS | |
| 1 | Ground | Ground | Ground |
| 2 | +12 V | +12 V | +12 V |
| 3 | VBS/Y output (ground) | VBS/Y output (ground) | VBS/Y output (ground) |
| 4 | VBS/Y output (signal) | VBS/Y output (signal) | VBS/Y output (signal) |
| 5 | HD input (ground) | — | — |
| 6 | HD input (signal) | — | — |
| 7 | VD input (signal) | VS input (signal) | — |
| 8 | –/C output (ground) | –/C output (ground) | –/C output (ground) |
| 9 | –/C output (signal) | –/C output (signal) | –/C output (signal) |
| 10 | Ground | Ground | Ground |
| 11 | +12 V | +12 V | +12 V |
| 12 | VD input (ground) | VS input (ground) | — |

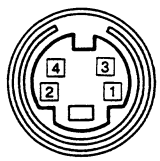
# CMA-999/999P RGB Adaptor

**Front**


1 Y/C connector
2 RGB/SYNC connector
3 CAMERA connector (for XC-999/999P)
4 SC phase control, H phase control and subcarrier phase switch
5 EXPOSURE TIME CONTROL switch
6 Exposure time control

**1 Y/C connector (4-pin)**
Use the YC-15EV connecting cable (not supplied) for connection.

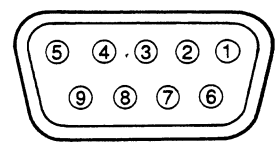
**Pin assignment of Y/C connector**




| Pin no. | Output signal |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | Y output |
| 4 | C output |

**2 RGB/SYNC connector (D-SUB 9-pin)**
This connector outputs the RGB signal. Use the CCXC-9DB/CCXC-9DD connecting cables (not supplied) for connection.

**Pin assignment of RGB/SYNC connector**



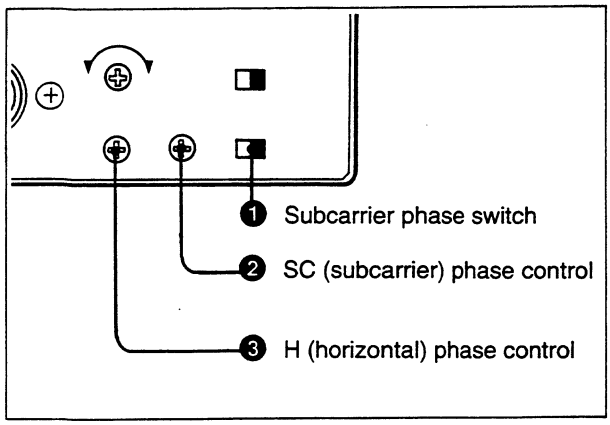

| Pin no. | Signal |
|---|---|
| 1 | Ground |
| 2 | Ground |
| 3 | RED output |
| 4 | GREEN output |
| 5 | BLUE output |
| 6 | VBS(Y) output |
| 7 | SYNC(HD) output |
| 8 | NC(HD input) |
| 9 | NC(VD input/output, C output) |

For input/output signal settings in ( ) in the above table, read the service manual Page 2-6 (E).

**3 CAMERA connector (12 pin)**
Connect to the XC-999/999P CCD color video camera module.

**4 SC phase control, H phase control and subcarrier phase switch**

These controls and switch are used for adjusting the picture tone when two or more cameras are connected.




**5 EXPOSURE TIME CONTROL switch**

**CCD IRIS**: Select this position so that the camera automatically adjusts the exposure time.

**MAN**: Select this position to adjust the exposure time with the exposure time control.

When you set the switch to either of the above positions, set the SHUTTER speed switches of the XC-999/999P color camera module to CCD IRIS.

**6 Exposure time control**

This switch works only when the EXPOSURE TIME CONTROL switch is set to MAN. The shutter speed can be adjusted by adjusting the exposure time.

**1 Subcarrier phase switch**

Set this switch so that the subcarrier phase difference between the genlock input and video output signals is 0° or 180°.

**2 SC (subcarrier) phase control**

Use this control for fine adjustment of the subcarrier phase after making a rough adjustment with the subcarrier phase switch.

**3 H (horizontal) phase control**

Use this control to adjust the H phase difference between the genlock input and video output signals.

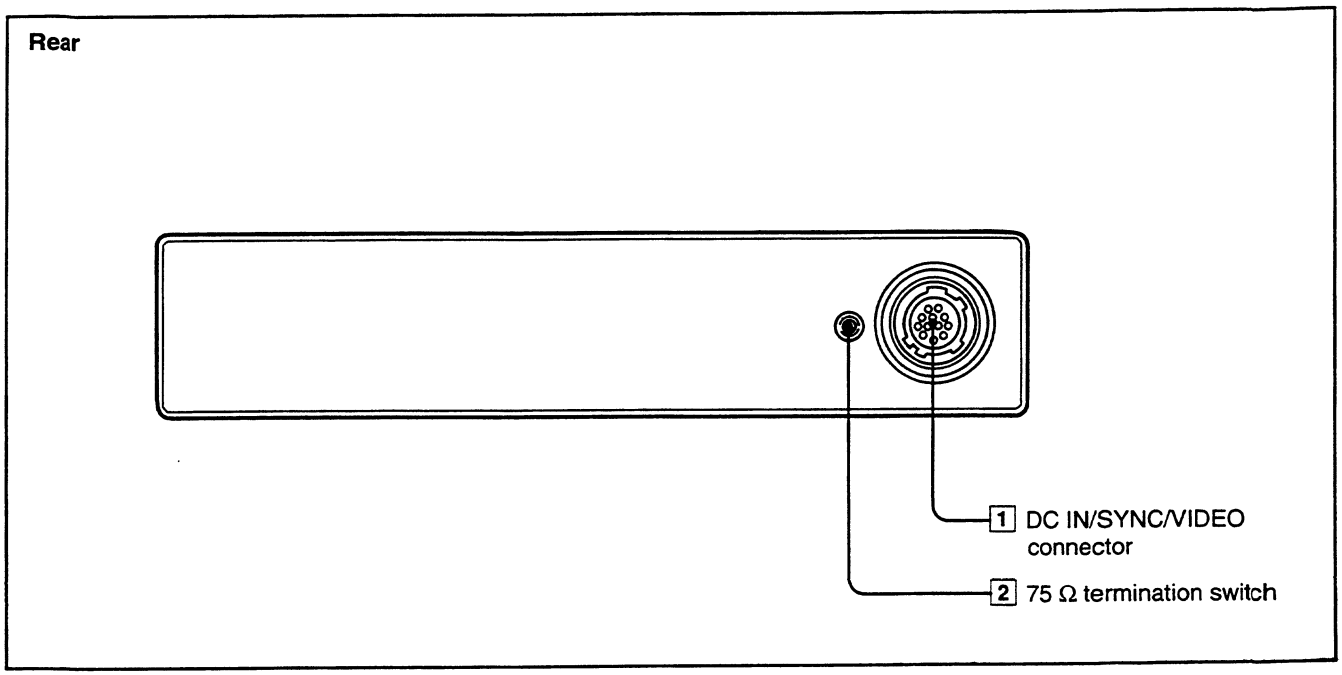
Adjust the subcarrier phase and horizontal phase by following the procedure below.

**Subcarrier phase adjustment**

Adjust the subcarrier phase roughly by setting the subcarrier phase switch to 0° or 180° so that the phase difference between the genlock input and video output signals is 0° or 180°. Then, make the fine adjustment by using the SC control. Using a vectorscope will allow you to make more accurate adjustment.

**Horizontal phase adjustment**

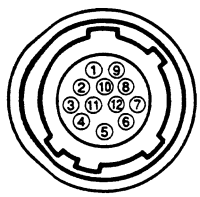
Adjust the horizontal phase with the H control. A waveform monitor or an oscilloscope will allow you to make the adjustment more easily.




**1 DC IN/SYNC/VIDEO connector**

Connect to the camera adaptor when you use the RGB adaptor with the DC-77RR/77RR-CE camera adaptor or the JB-77 junction box.

**Pin assignment of DC IN/SYNC/VIDEO connector**




| Signal / Pin. No. | Sync signals | | |
|---|---|---|---|
| | External sync signal | | Internal sync signal |
| | HD, VD | VBS/VS | |
| 1 | Ground | Ground | Ground |
| 2 | +12 V | +12 V | +12 V |
| 3 | VBS output (ground) | VBS output (ground) | VBS output (ground) |
| 4 | VBS output (signal) | VBS output (signal) | VBS output (signal) |
| 5 | HD input (ground) | — | — |
| 6 | HD input (signal) | — | — |
| 7 | VD input (signal) | VBS/VS input (signal) | — |
| 8 | — | — | — |
| 9 | — | — | — |
| 10 | Ground | Ground | Ground |
| 11 | +12 V | +12 V | +12 V |
| 12 | VD input (ground) | VBS/VS input (ground) | — |

**2 75 Ω termination switch**

Use this switch to terminate the external sync signal (HD/VD, VBS and VS).

**ON :**

Set this switch to ON when using the camera with the JB-77 junction box.

**OFF :** (factory setting)

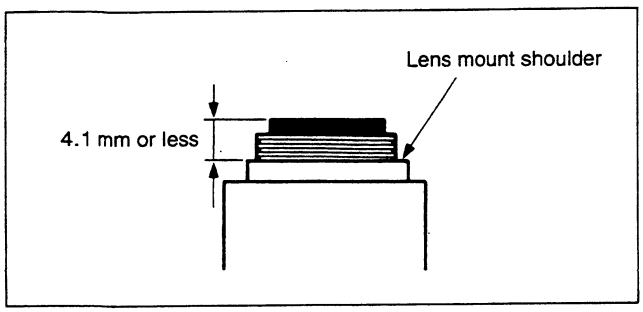
Set this switch to OFF to terminate at the DC-77RR/77RR-CE side when using the RGB adaptor with the DC-77RR/77RR-CE camera adaptor

## 1-4. INSTALLATION

# Usable lens

You can use the following lenses with the camera.

**Special lens (not supplied)**
- VCL-12S12XM special MT lens (f=12mm)
- VCL-06S12XM special MT lens (f=6mm)




**C mount lens**
By using the LO-999CMT C-mount lens adaptor, you can mount any 1/2-inch C-mount lens that does not project more than 4.1mm .

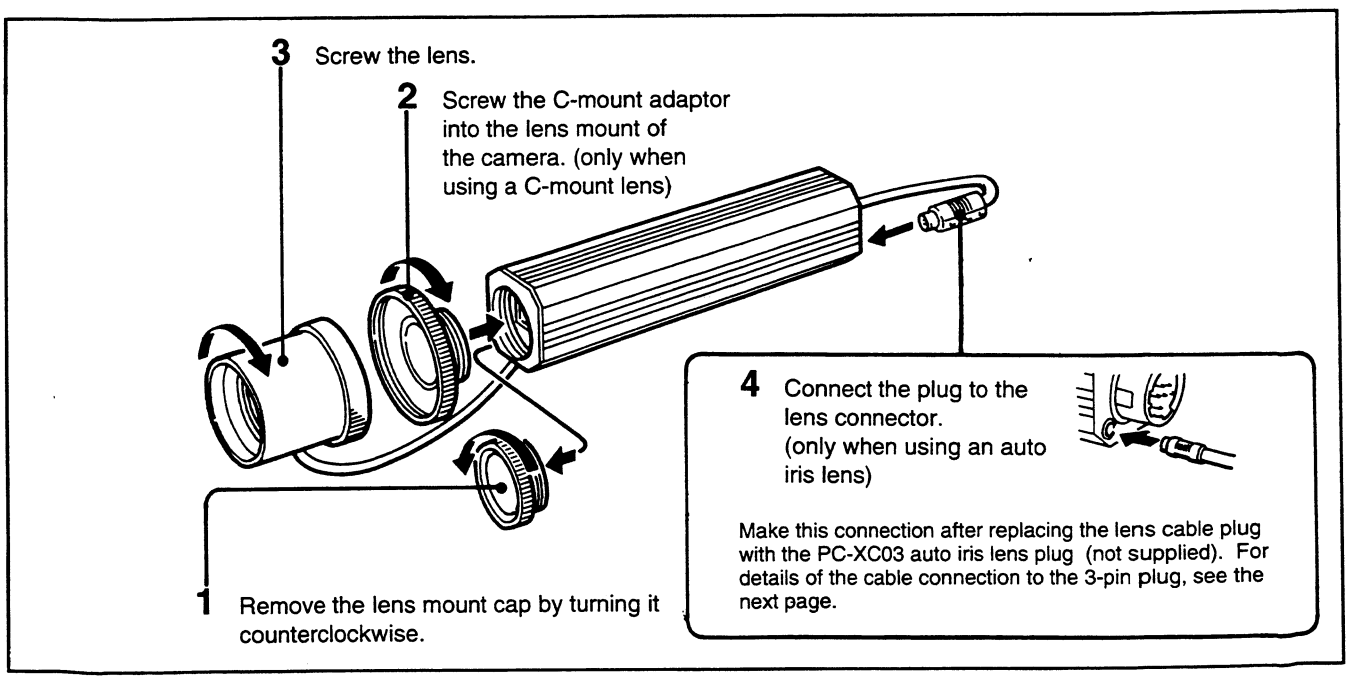
**Note**

This camera uses a 1/2-inch CCD, so the lens should be intended for use with this size of CCD. In particular, if used with a lens intended for a 2/3-inch CCD, the angle of view will be different.

# Attaching the Lens

**Notes**

- The plug is very small and fragile. Take special care when handling it.
- Do not pull the lens cord connected to the lens adaptor. If so, the plug or camera lens connector may be damaged.

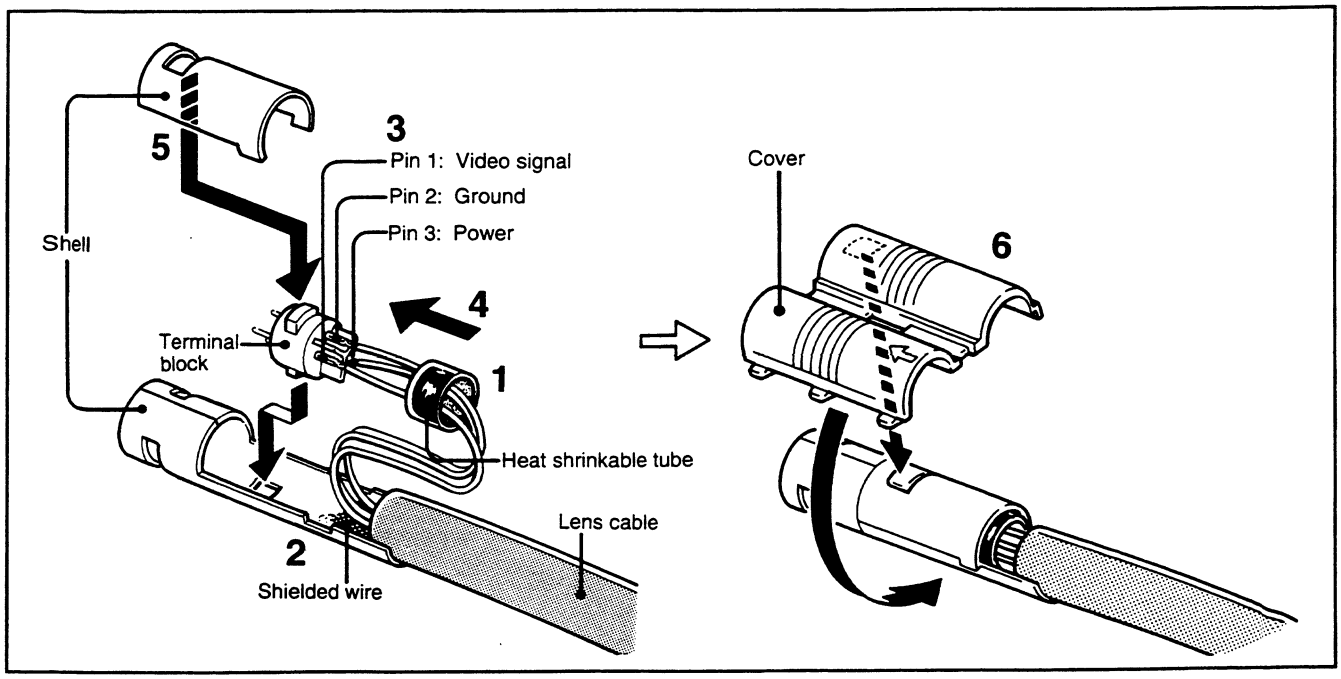

3 Screw the lens.
2 Screw the C-mount adaptor into the lens mount of the camera. (only when using a C-mount lens)
4 Connect the plug to the lens connector. (only when using an auto iris lens)
Make this connection after replacing the lens cable plug with the PC-XC03 auto iris lens plug (not supplied). For details of the cable connection to the 3-pin plug, see the next page.
1 Remove the lens mount cap by turning it counterclockwise.

## Replacing the lens cable plug with the PC-XC03 auto iris lens plug (not supplied)

To use an auto iris lens, replace the cable end plug with the PC-XC03 auto iris lens plug (not supplied) as shown below.

**Notes**

- When handling or soldering, treat the plug very carefully.
- When soldering the wires to the plug pins, solder them with a soldering iron temperature of less than 280°C (540°F). Perform the soldering quickly within three seconds.




**1** Remove the plug from the lens cable. Place the heat shurinkable tube over the lens cable.

**2** Solder the shielded wire onto the inside of the shell as illustrated.

**3** Solder the cable wires to the pins of the plug. (To identify the cable wires, refer to the manual for your lens.)

**Note**

Solder them with a soldering iron temperature of less than 280°C. Perform the soldering within three seconds.

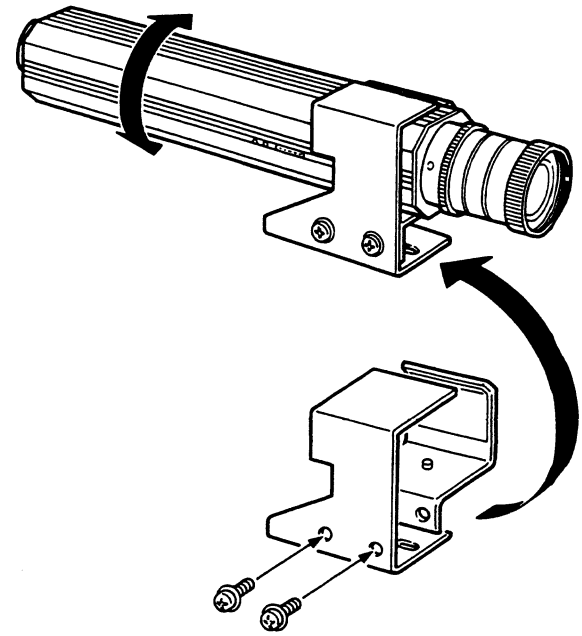
**4** After soldering, slide the heat shrinkable tube up agaist the terminal block. Secure the wires by heating the heat shrinkable tube with a soldering iron or dryer.

**5** Place the terminal block to one half of the shell, then fit the other half of the sell.

**6** Fit the plastic cover over the shell.

## Installing the Camera

When using the camera mounted on a tripod, screw the camera to the tripod adaptor (supplied) as shown. You can install the color video camera module on the tripod adaptor in any of four directions.



Decide the direction and fix the camera using two screws

## 1-5. CONNECTIONS

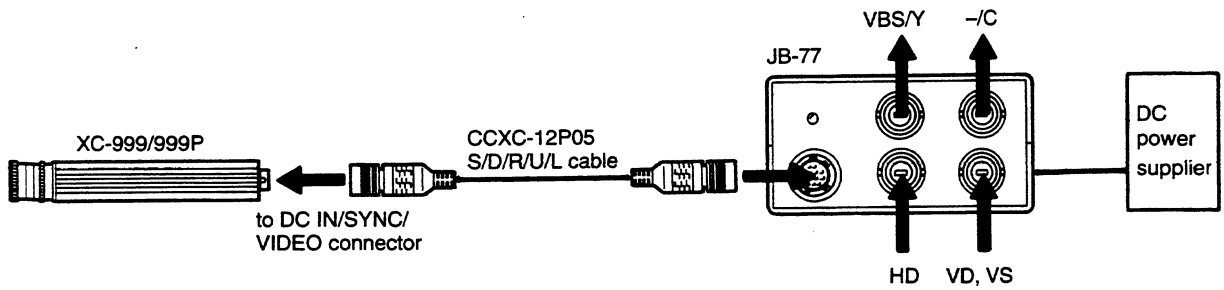
This section explains the following three connections.

- Using the camera with the JB-77 junction box
- Using the camera with the CMA-999/999P RGB adaptor
- Using the camera with the DC-77RR/77RR-CE camera adaptor

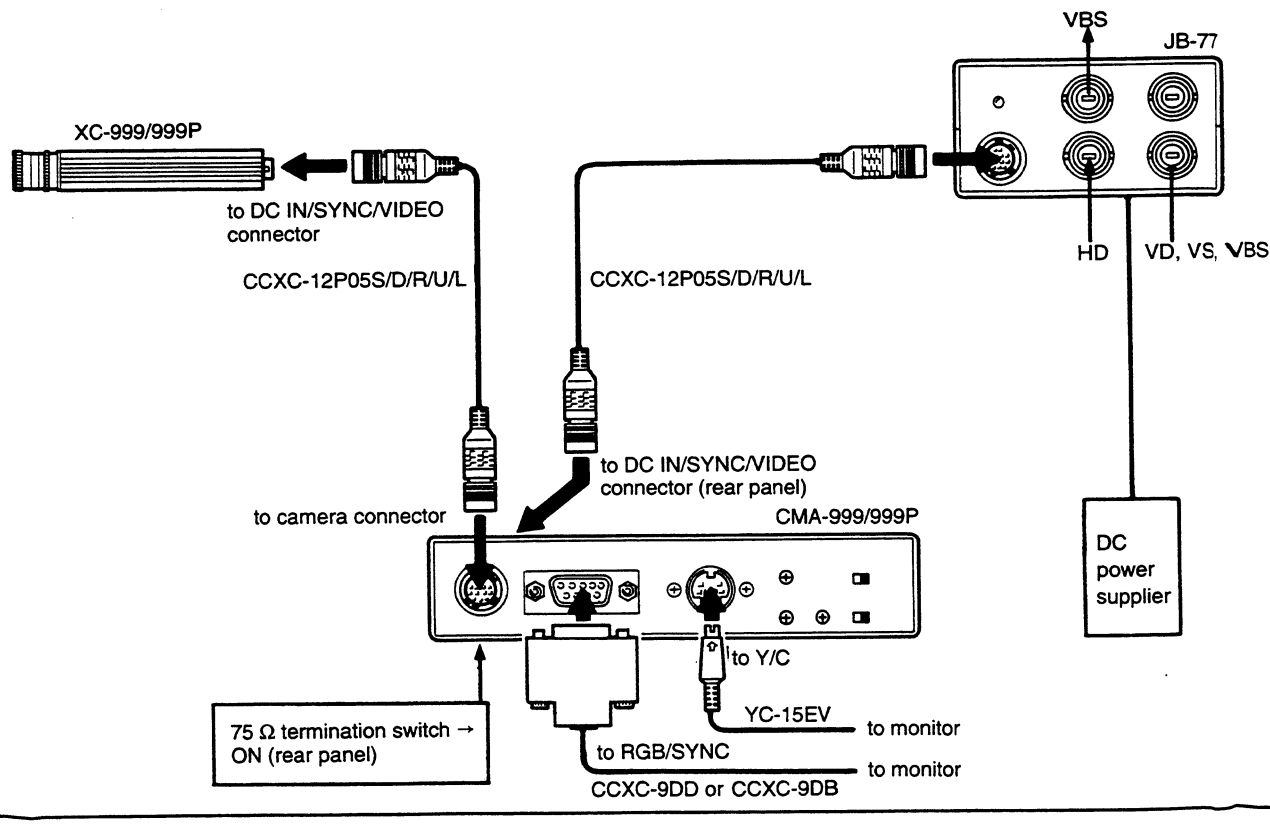
**Notes**

- Turn off the units to be connected, or the components of the units may be damaged.
- To disconnect the cord, pull it out by the plug. Never pull the cord itself.
- Connect the power cord after completing all other connections.

### When Using the Camera with the JB-77 Junction Box




### When Using the Camera with the CMA-999/999P RGB Adaptor



# When Using the Camera with the DC-77RR/77RR-CE Camera Adaptor

**Before connection**

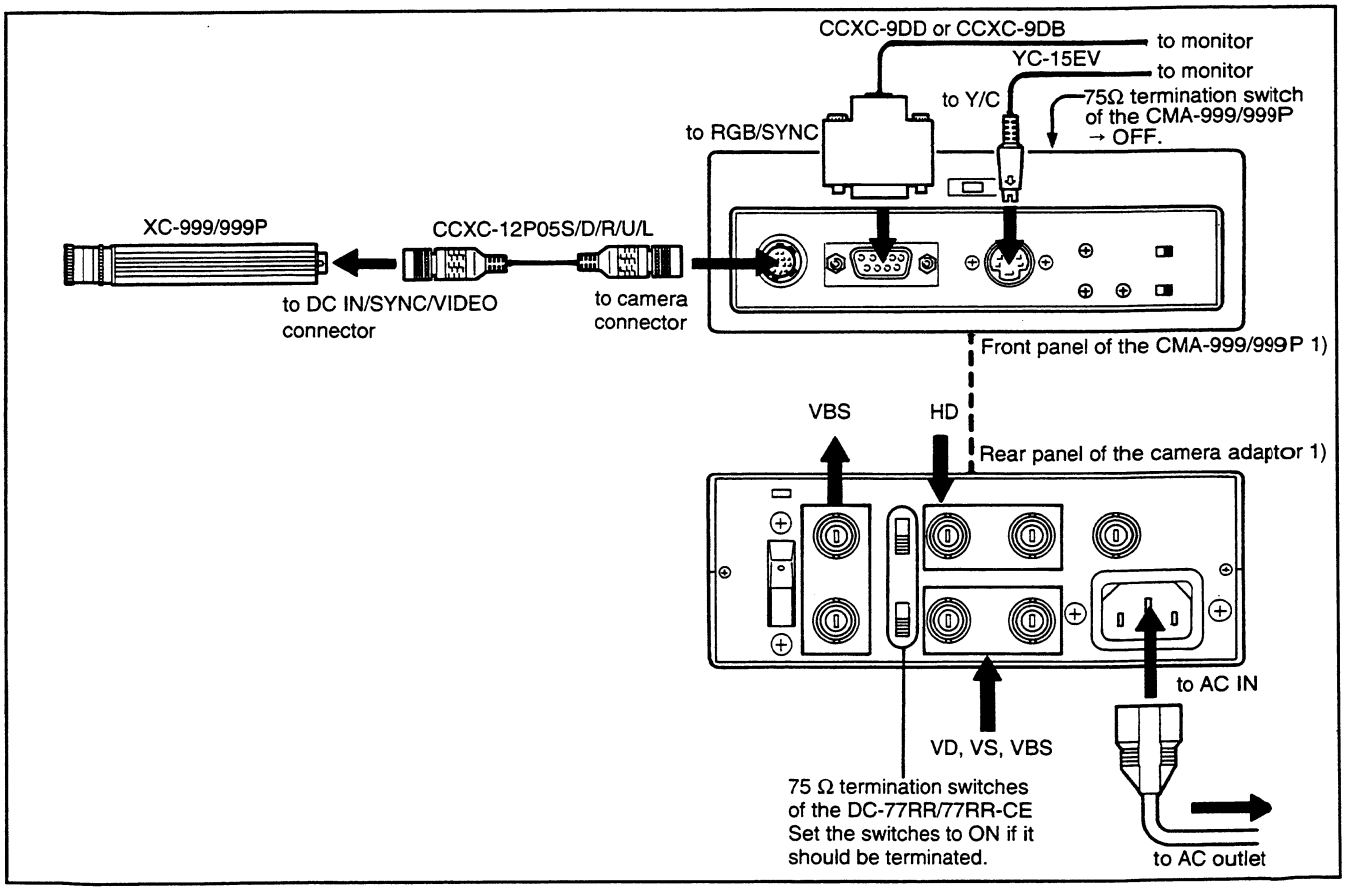
Install the CMA-999/999P RGB adaptor into the camera adaptor. For details, see the instruction manual for the DC-77RR/77RR-CE camera adaptor.

**Notes**

- Set the 75 Ω termination switch of the RGB adaptor to OFF.
- Insert the RGB adaptor into the camera adaptor firmly so that the DC IN/SYNC/VIDEO connector of the RGB adaptor is connected securely to the connector of the camera adaptor.

**Connection**

Make sure that the 75 Ω termination switch of the RGB adaptor is set to OFF.




1) The RGB adaptor is connected to the camera adaptor. Fix the RGB adaptor and the camera adaptor at the bottom of the camera adaptor by using two screws. Refer to the instruction manual of the DC-77RR/77RR-CE for detailed explanation of installing the RGB adaptor into the camera adaptor.

## Genlock

The color video camera module is designed so that internal sync and external sync are switched automatically. When the color video camera module receives the following external sync signal, the camera is synchronized to that external sync signal.

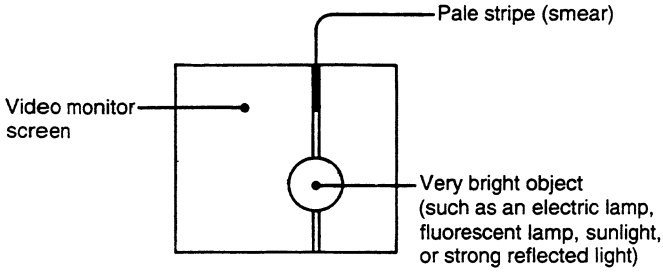
| Connection example | External sync signal | | |
|---|---|---|---|
| | HD/VD | VS | VBS |
| XC-999/999P – JB-77 | Genlock | | * 1 |
| XC-999/999P – CMA-999/999P – JB-77 | Genlock | | |
| XC-999/999P – CMA-999/999P – DC-77RR/77RR-CE | Genlock | | |

* 1 : Horizontal sync and Vertical sync are available, but the color signal phase can not be adjusted.

## 1-6. CCD SPECIAL CHARACTERISTICS

The following conditions that may be observed during the use of a CCD video camera are not associated with any fault of the camera:

**Smearing**
The picture may be smeared when a very bright object is shot.


Pale stripe (smear)
Video monitor screen
Very bright object (such as an electric lamp, fluorescent lamp, sunlight, or strong reflected light)

**Patterned noise**
This may appear over the entire monitor screen when the camera is operated at a high temperature.

**Jagged picture**
When thin stripes, straight lines, or the like are shot, the image monitored on the screen may appear jagged.

## 1-7. SPECIFICATIONS

**Pickup device**

| | |
|---|---|
| Pickup device | Interline transfer 1/2 inch CCD |
| Color filter | Complementary color mosaic filter |
| Picture elements | XC-999: 768 (H) x 494 (V)<br>XC-999P: 752 (H) x 582 (V) |
| Sensing area | 6.4 x 4.8 mm |

**Optical and others**

| | |
|---|---|
| Lens mount | Special mount |
| Signal system | XC-999: NTSC standard<br>XC-999P: PAL standard |
| Scanning system | XC-999: 525 lines, 2:1 interlace, 30 frames/s.<br>XC-999P: 625 lines, 2:1 interlace, 25 frames/s. |
| Sync system | Internal/external (switched automatically) |
| External sync signal | HD/VD, VS |
| Horizontal resolution | XC-999: 470 TV lines<br>XC-999P: 460 TV lines |
| Minimum illumination | 4.5 lux, F1.2 AGC: ON |
| Sensitivity | 2000 lux F5.6 AGC: OFF (0 dB) |
| Video output | VBS / Y/C (selected with the switch)<br>VBS: 1 Vp-p, 75 ohms, sync negative<br>Y: 1 Vp-p, 75 ohms<br>C: C level depends on the composite video out signal |
| Video signal to noise ratio | XC-999: more than 48 dB<br>AGC: OFF (0dB)<br>XC-999P: more than 46 dB<br>AGC: OFF (0dB) |
| Shutter speed | 4 speeds selectable: OFF (1/60 s (XC-999) or 1/50 s (XC-999P)), 1/1000 s, CCD IRIS and flickerless |
| White balance | 4 modes selectable: ATW (auto tracing white balance), 3200K, 5600K and MAN (manual) |
| Gain control | 2 modes selectable: AGC and fixed (0 dB) |
| Output connector | DC IN/SYNC/VIDEO: multi 12-pin<br>LENS: 3-pin |
| Power requirement | 10.5 to 15 V DC |
| Power consumption | 3.5 W |
| Operating temperature | 0°C to 40°C (32°F to 104°F) |
| Storage temperature | –20°C to 60°C (–4°F to 140°F) |
| Operating humidity | 80 % (no condensation permissible) |
| Storage humidity | 90 % (no condensation permissible) |
| Shock resistance | Less than 70G |
| Dimensions | 22 x 22 x 120 mm (w/h/d)<br>(7/8 x 7/8 x 4 3/4 inches)<br>excluding projecting parts |
| Weight | About 99 g (3 1/2 oz) |
| Accessories supplied | Tripod adaptor (1 set)<br>Lens mount cap (1)<br>Screw driver (1)<br>Label (1) |

# Accessories not supplied

## Camera adaptor

CMA-999/999P RGB adaptor
Specifications of the CMA-999/999P are as follows.

| | |
|---|---|
| Power requirement | 10.5 to 15 V DC |
| Power consumption | 4.5 W |
| Operating temperature | 0°C to 40°C (32°F to 104°F) |
| Storage temperature | –20°C to 60°C (–4°F to 140°F) |
| Operating humidity | 80 % (no condensation permissible) |
| Storage humidity | 90 % (no condensation permissible) |
| Shock resistance | Less than 40G |
| Dimensions | 135.5 x 30 x 69 mm (w/h/d) (5 3/8 x 1 3/16 x 2 3/4 inches) excluding projecting parts |
| Weight | About 290 g (10 1/4 oz) |
| Camera adaptor | DC-77RR/77RR-CE |
| Junction box | JB-77 |

## Lens and lens accessories

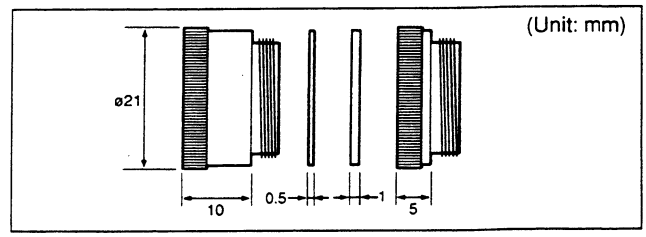
| | |
|---|---|
| Special mount lens | VCL-12S12XM special MT lens (f=12mm)<br>VCL-06S12XM special MT lens (f=6mm)<br>VCL-03S12XM special MT lens (f=3.5mm)<br>VCL-7S12XEA special MT lens (f=7mm) |
| C Mount adaptor | LO-999CMT |
| Extension ring kit | LO-999ERK |
| Lens plug (for AUTO IRIS) | PC-XC03 |

## Cables

| | |
|---|---|
| 12-pin camera cable | CCXC-12P05S/D/R/U/L |
| Connecting cables | CCXC-9DD (with D-SUB 9-pin connectors)<br>CCXC-9DB (with D-SUB 9-pin and five BNC connectors)<br>YC-15EV (with DIN 4-pin connectors) |

## Extension Ring Kit

LO-999ERK




Object dimensions and focusing ranges when using the extension ring kit

**Reading the table (unit: mm)**

t = Thickness of each extension ring
↑
0.5 FAR 158×118 290
NEAR 73× 55 145
↓ ↓ ↓
Focus position — Object dimensions — Object distance from the head of mechanism

(Focusing ranges)

| t | Focus | VCL-12S12XM (f = 12 mm) | | VCL-06S12XM (f = 6 mm) | |
|---|---|---|---|---|---|
| 0.5 | FAR | 158 × 118 | 290 | 78 × 59 | 65 |
| | NEAR | 73 × 55 | 145 | 61 × 46 | 47 |
| 1 | FAR | 79 × 59 | 139 | 39 × 29 | 27 |
| | NEAR | 52 × 39 | 98 | 34 × 25 | 22 |
| 1.5 | FAR | 52 × 39 | 88 | 26 × 20 | 15 |
| | NEAR | 40 × 30 | 72 | 23 × 18 | 12 |
| 5 | FAR | 16 × 12 | 18 | | |
| | NEAR | 16 × 12 | 18 | | |
| 10 | FAR | 8 × 6 | 2 | | |
| | NEAR | 8 × 6 | 1 | | |

The values shown in the table are for a 1/2-inch camera.

Design and specifications are subject to change without notice.

# SECTION 2
# COMPREHENSIVE SPECIFICATIONS

## 2-1. SPECIFICATIONS

**<CAMERA MODULE XC-999/999P>**

**Pickup device**

| | |
|---|---|
| Pickup device | Interline transfer 1/2 inch CCD |
| Color filter | Complementary color mosaic filter |
| Picture elements | XC-999: 768 (H) x 494 (V)<br>XC-999P: 752 (H) x 582 (V) |
| Sensing area | 6.4 x 4.8 mm |

**Optical and others**

| | |
|---|---|
| Lens mount | Special mount |
| Signal system | XC-999: NTSC standard<br>XC-999P: PAL standard |
| Scanning system | XC-999: 525 lines, 2:1 interlace, 30 frames/s.<br>XC-999P: 625 lines, 2:1 interlace, 25 frames/s. |
| Sync system | Internal/external (switched automatically) |
| External sync signal | HD/VD (2 to 4 V p-p), 75 ohms<br>VS (1.0 V p-p), 75 ohms<br>S (SYNC, 2~4 V p-p), 75 ohms |
| External sync frequency tolerance | XC-999: VD 59.94 ± 0.0009 Hz<br>HD 15734.264 ± 0.016 Hz<br>XC-999P: VD 50 ± 0.00005 Hz<br>HD 15625 ± 0.0156 Hz |
| Horizontal resolution | XC-999: 470 TV lines<br>XC-999P: 460 TV lines |
| Minimum illumination | 4.5 lux, F1.2 AGC: ON |
| Sensitivity | 2000 lux F5.6 AGC: OFF (0 dB) |
| Video output | VBS / Y/C (selected with the switch)<br>VBS: 1 Vp-p, 75 ohms, sync negative<br>Y: 1 Vp-p, 75 ohms<br>C: C level depends on the composite video out signal |
| Video signal to noise ratio | XC-999: more than 48 dB<br>AGC: OFF (0dB)<br>XC-999P: more than 46 dB<br>AGC: OFF (0dB) |
| Shutter speed | 4 speeds selectable: OFF (1/60 s (XC-999) or 1/50 s (XC-999P)), 1/1000 s, CCD IRIS and flickerless |
| White balance | 4 modes selectable: ATW (auto tracing white balance), 3200K, 5600K and MAN (manual) |
| Gain control | 2 modes selectable: AGC and fixed (0 dB) |
| Output connector | DC IN/SYNC/VIDEO: multi 12-pin<br>LENS: 3-pin |
| Power requirement | 10.5 to 15 V DC |
| Power consumption | 3.5 W |
| Operating temperature | 0°C to 40°C (32°F to 104°F) |
| Storage temperature | –20°C to 60°C (–4°F to 140°F) |
| Operating humidity | 80 % (no condensation permissible) |
| Storage humidity | 90 % (no condensation permissible) |
| Shock resistance | Less than 70G |
| Dimensions | 22 x 22 x 120 mm (w/h/d)<br>(7/8 x 7/8 x 4 3/4 inches)<br>excluding projecting parts |
| Weight | About 99 g (3 1/2 oz) |

**<RGB ADAPTOR CMA-999/999P>**

| | |
|---|---|
| External sync signal | VBS (1.0 V p-p), 75 ohms<br>HD/VD (2 to 4 V p-p), 75 ohms<br>VS (1.0 V p-p), 75 ohms<br>S (SYNC, 2~4 V p-p), 75 ohms |
| Output connector | Y/C: 4-pin |
| Input/Output connector | RGB/SYNC: D-SUB 9-pin<br>CAMERA: multi 12-pin<br>DC IN/SYNC/VIDEO: multi 12-pin |
| Power requirement | 10.5 to 15 V DC |
| Power consumption | 4.5 W |
| Operating temperature | 0 °C to 40 °C (32 °F to 104 °F) |
| Storage temperature | –20°C to 60°C (–4°F to 140°F) |
| Operating humidity | 80 % (no condensation permissible) |
| Storage humidity | 90 % (no condensation permissible) |
| Shock resistance | Less than 40G |
| Dimensions | 135.5 x 30 x 69 mm (w/h/d)<br>(5 3/8 x 1 3/16 x 2 3/4 inches)<br>excluding projecting parts |
| Weight | About 290 g (10 1/4 oz) |

**<SPECIAL MOUNT LENS VCL-03S12XM>**

Focal Length f=3.5 mm

**<SPECIAL MOUNT LENS VCL-06S12XM>**

Focal Length f=6 mm

**<SPECIAL MOUNT LENS VCL-12S12XM>**

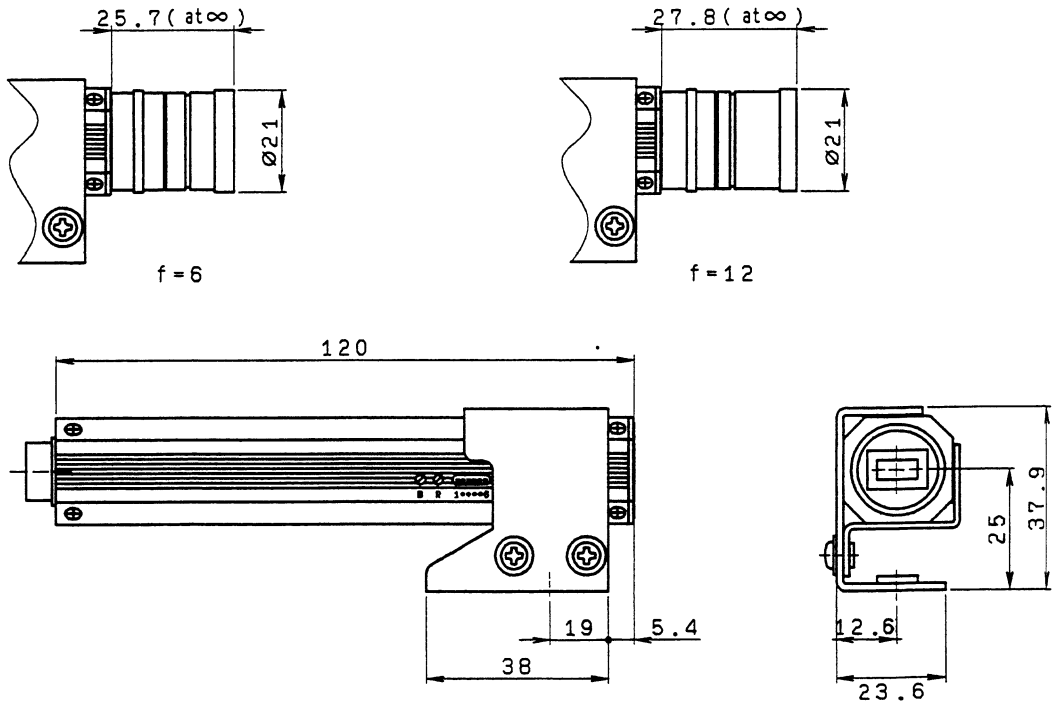
Focal length f=12 mm

**<SPECIAL MOUNT LENS VCL-7S12XEA>**

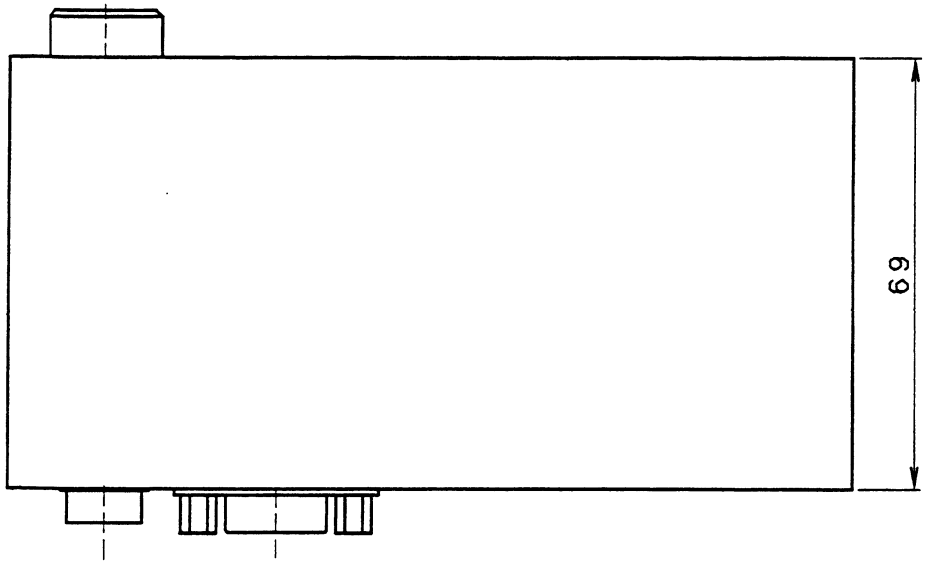
Focal Length f=7 mm

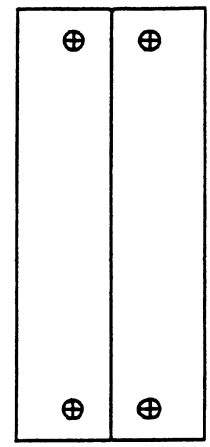
Dimensions :

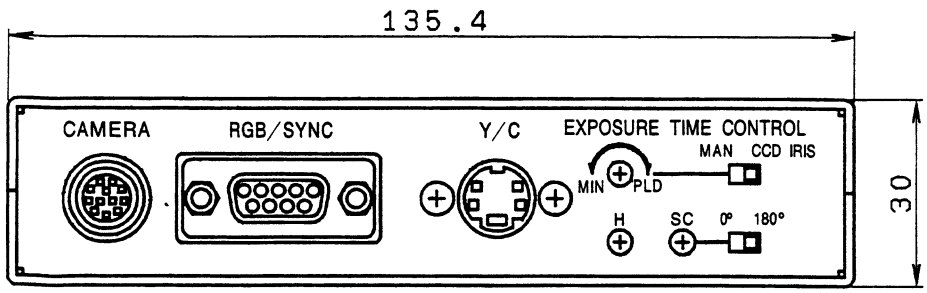
Camera Module < XC-999/999P >



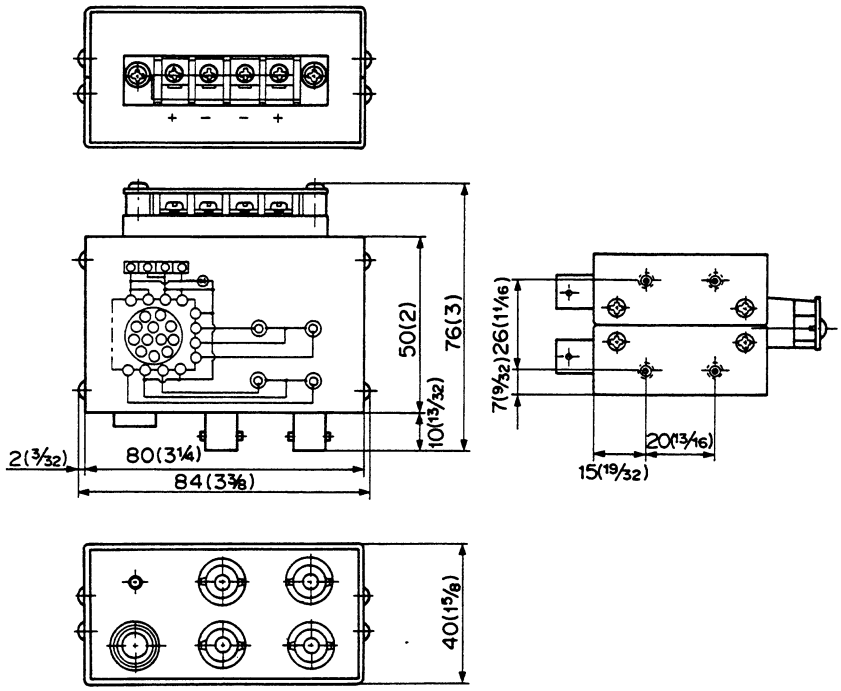
RGB Adaptor < CMA-999/999P >



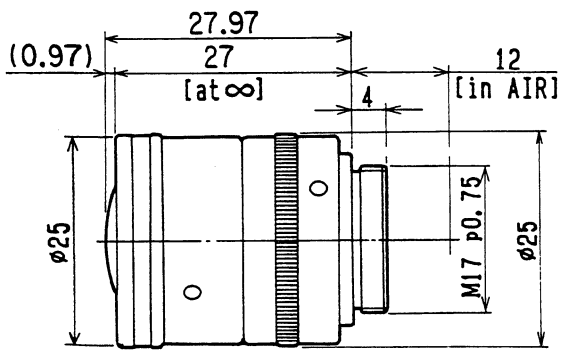





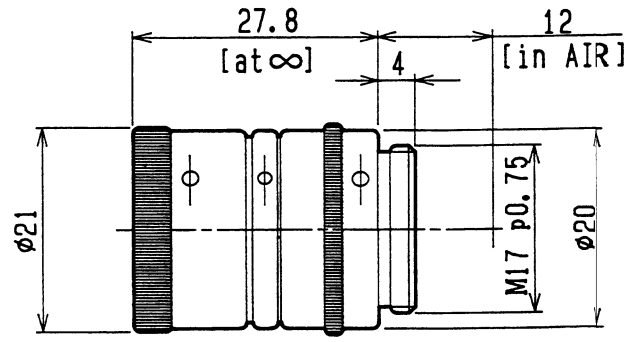
Junction box < JB-77 >



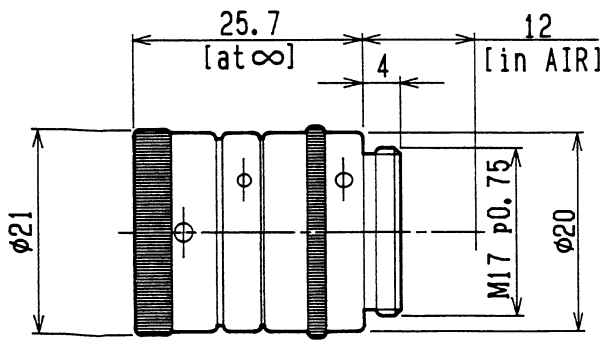

Lens < VCL-03S12XM >



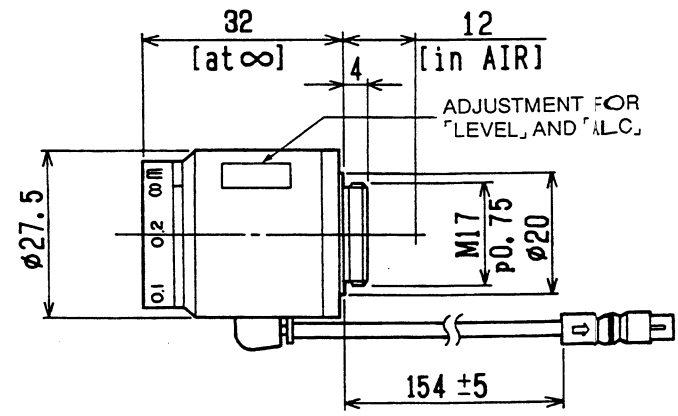

Lens < VCL-12S12XM >




Lens < VCL-06S12XM >




Lens < VCL-7S12XEA >



## 2-2. EXTERNAL SYNC MODE

External sync mode is primarily classified into two modes; one is for the XC-999/999P only use, and the other is in combination with the XC-999/999P and CMA-999/999P.
(Refer to 「2-1. SPECIFICATIONS」 for the frequency tolerance. Refer to 「2-4-1. Connector Input and Output Signals」 for the level of signal.)

XC-999/999P only use
- S/VS mode
- HD, VD mode

Combination with the XC-999/999P and CMA-999/999P
- S/VS/VBS mode
- HD, VD mode

① S/VS mode

External synchronization is achieved by adding a regular composite signal (S or VS) to pin 7 of 12-pin connector.

② S/VS/VBS mode

External synchronization is achieved by adding a regular composite signal (S, VS or VBS) to pin 7 of 12-pin connector.

② HD, VD modes

External synchronization is achieved by adding a regular HD and VD signals to pin 6 and 7 of 12-pin connector respectively.

## 2-3. SETTING OF OPERATING MODE

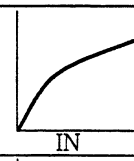
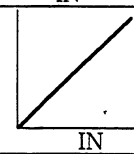
The XC-999/999P and CMA-999/999P can select the operating mode according to use. The mode setting can be switched by changing mode select jumpers (chip resisters).

Description of each operating mode

1. XC-999/999P

Gamma correction mode (Gamma ON/OFF)

The gamma correction mode for the video output signal is set.
When the mode is set to ON, gamma-corrected video signal is output.
When the mode is set to OFF, a video signal in proportion to light intensity of an object is obtained because the gamma correction is not performed. The setting is changed with combination of mode select jumpers JR301 and JR302 on the PR-153/153P board. The gamma correction mode is set to ON at factory.

| MODE | Input/Output voltage characteristics | Mode select jumper |
|---|---|---|
| γ ON (0.45) |   | PR-153/153P board<br>JR301 : M't<br>JR302 : OPEN<br>(Factory setting) |
| γ OFF (1.0) |   | PR-153/153P board<br>JR301 : OPEN<br>JR302 : M't |

## 2. CMA-999

• Initial setting on the boards (Factory setting condition)

The output signal at 9-pin D-sub connector is as follows.

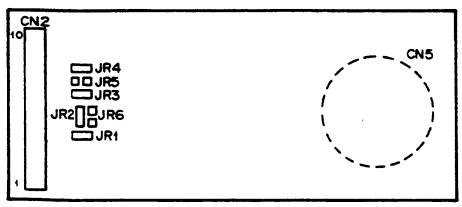
Output signal at 9-pin D-sub connector

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | RED OUT |
| 4 | GREEN OUT |
| 5 | BLUE OUT |
| 6 | VBS OUT |
| 7 | SYNC OUT |
| 8 | ——— |
| 9 | ——— |

① CN-516 board

Mode select jumper

| CN-516 board (A side) |
|---|
| JR1 : M't |
| JR2 : M't |
| JR3 : M't |
| JR5 : OPEN |
| JR6 : OPEN |

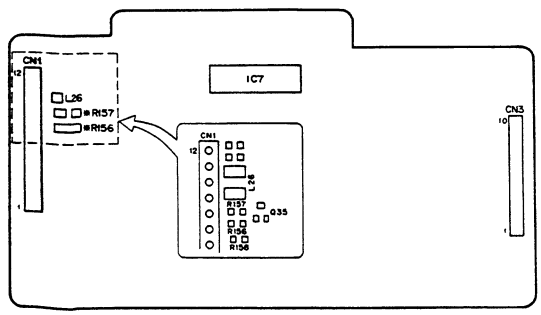



CN-516 board (A side)

② EN-98/98P board

Mode select jumper

| EN-98/98P board (B side) |
|---|
| R156 : M't (1 KΩ) |
| R157 : OPEN |



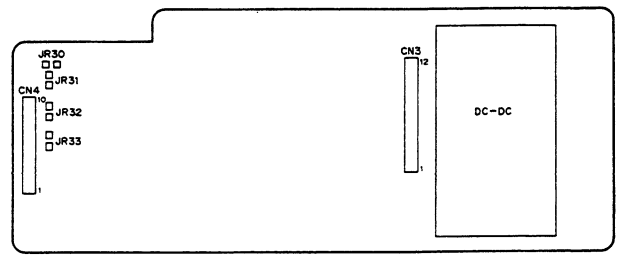

‡:The reference numbers are not printed on the board.

EN-98/98P board (B side)

③ SG-185/185P board

Mode select jumper

| SG-185/185P board (A side) |
|---|
| JR30 : OPEN |
| JR31 : OPEN |
| JR32 : OPEN |
| JR33 : OPEN |

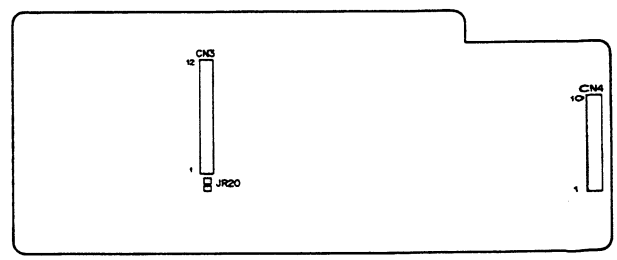



SG-185/185P board (A side)

④ SG-185/185P board

Mode select jumper

| SG-185/185P board (B side) |
|---|
| JR20 : OPEN |




SG-185/185P board (B side)

• Method of outputing Y/C signal from 9-pin D-sub connector.

CN-516 board

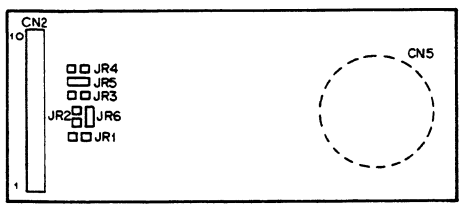
Output signal at 9-pin D-sub connector

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | RED OUT |
| 4 | GREEN OUT |
| 5 | BLUE OUT |
| 6 | Y OUT |
| 7 | SYNC OUT |
| 8 | ——— |
| 9 | CHROMA OUT |

Mode select jumper

| CN-516 board(A side) |
|---|
| JR1 : OPEN<br>JR2 : OPEN<br>JR3 : OPEN<br>JR4 : OPEN<br>JR5 : M't<br>JR6 : M't |

( In this case, no signal is output to Y/C connector. )




CN-516 board (A side)

• Method of outputing HD/VD signal from 9-pin D-sub connector.

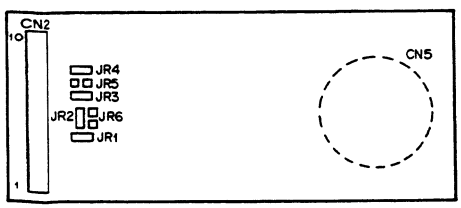
Output signal at 9-pin D-sub connector

| | |
|---|---|
| 7 | HD OUT |
| 8 | ——— |
| 9 | VD OUT |

① CN-516 board

Mode select jumper

| CN-516 board (A side) |
|---|
| JR4 : M't<br>JR5 : OPEN |

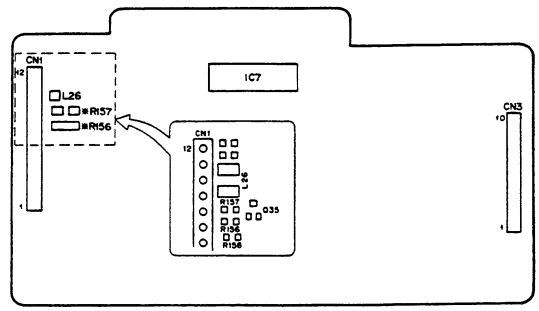



CN-516 board (A side)

② EN-98/98P board

Mode select jumper

| EN-98/98P board (B side) |
|---|
| R156 : OPEN<br>R157 : 1 kΩ M't |



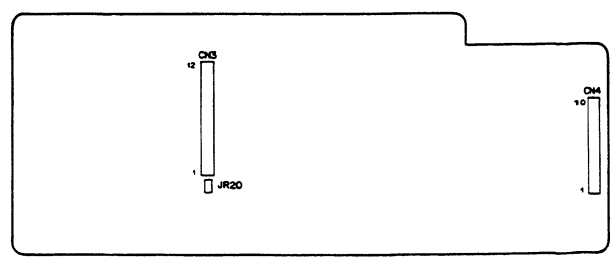

*:The reference numbers are not printed on the board.

EN-98/98P board (B side)

③ SG-185/185P board

Mode select jumper

| SG-185/185P board (B side) |
|---|
| JR20 : M't |




SG-185/185P board (B side)

・Method of inputing HD/VD signal from 9-pin D-sub connector.

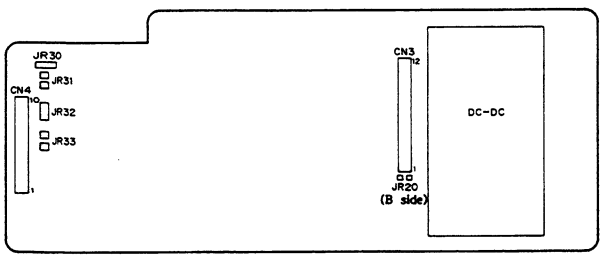
Output signal at 9-pin D-sub connector

| | |
|---|---|
| 7 | SYNC OUT |
| 8 | HD IN |
| 9 | VD IN |

① SG-185/185P board

Mode select jumper

| SG-185/185P board |
|---|
| JR20 : OPEN (B side) |
| JR30 : M't (A side) |
| JR31 : OPEN (A side) |
| JR32 : M't (A side) |
| JR33 : OPEN (A side) |

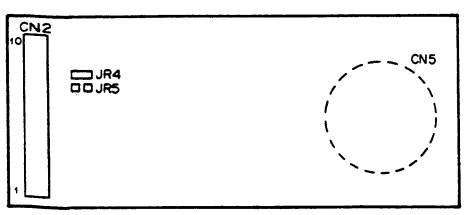



SG-185/185P board (A side)

② CN-516 board

Mode select jumper

| CN-516 board (A side) |
|---|
| JR4 : M't |
| JR5 : OPEN |




CN-516 board (A side)

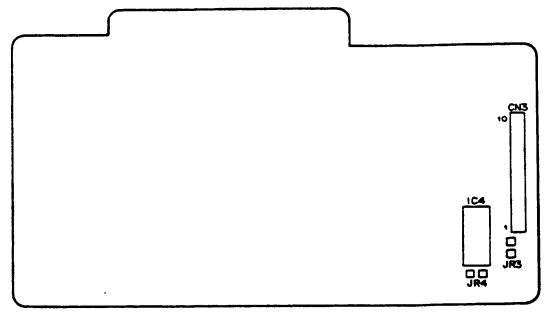
・G ON SYNC mode

The ON/OFF of superimposing the SYNC signal to the GREEN OUT can be selected by changing mode select jumpers (chip resistors) or S2 switch on the EN-98/98P board as follows.
Select according to use.

9-pin D-sub connector
Output at pin 4 (GREEN OUT)

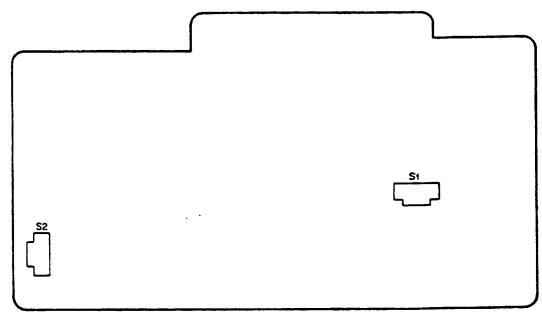
① Setting by the mode select jumper

| Mode | EN-98/98P board (B side) |
|---|---|
| SYNC ON | JR3 : OPEN<br>JR4 : M't<br>(Mode select jumper) |
| SYNC OFF | JR3 : M't<br>JR4 : OPEN<br>(Mode select jumper) |




EN-98/98P board (B side)

② Setting by the S2 switch




EN-98/98P board (A side)

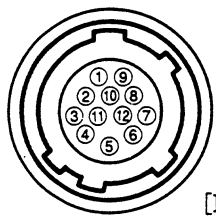
## 2-4. CONNECTOR AND CABLES

### 2-4-1. Connector Input and Output Signals

Connector input and output signals are shown below.

1. XC-999/999P

DC IN/SYNC/VIDEO (12P, MALE)



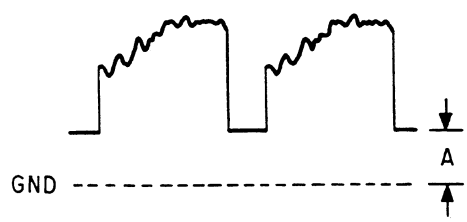

[EXT VIEW]

| | Sync Signals | | | | | |
|---|---|---|---|---|---|---|
| | External sync signal | | | | Internal sync signal | |
| | HD, VD | | S, VS | | | |
| No | Signal | Specifications | Signal | Specifications | Signal | Specifications |
| 1 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 2 | +12V IN | +12 Vdc | +12V IN | +12 Vdc | +12V IN | +12 Vdc |
| 3 | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y |
| 4 | VBS/Y OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, sync negative | VBS/Y OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, sync negative | VBS/Y OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, sync negative |
| 5 | GND(HD) | GND for HD | ——— | | ——— | |
| 6 | HD IN | 2 to 4 Vp-p, 75Ω | ——— | | ——— | |
| 7 | VD IN | 2 to 4 Vp-p, 75Ω | S/VS IN | 2 to 4 Vp-p, 75Ω | ——— | |
| 8 | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C |
| 9 | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT |
| 10 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 11 | +12V IN | +12 Vdc | +12V IN | +12 Vdc | +12V IN | +12 Vdc |
| 12 | GND(VD) | GND for VD | GND(S/VS) | GND for S/VS | ——— | |

LENS (3P, FEMALE)

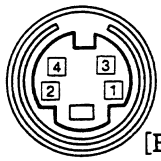
[EXT VIEW]

| No | Signal | Specifications |
|---|---|---|
| 1 | IRIS OUT | A=1.7 to 2.0 Vdc |
| 2 | GND | |
| 3 | DC OUT | +12 Vdc |



## 2. CMA-999/999P

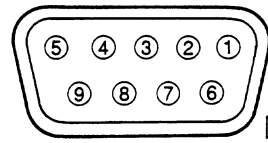
### Y/C (4P, FEMALE)



[EXT VIEW]

| No | Signal | Specifications |
|---|---|---|
| 1 | GND | |
| 2 | GND | |
| 3 | Y OUT | 1 Vp-p, 75Ω |
| 4 | CHROMA OUT | Level depends on the composite video signal |

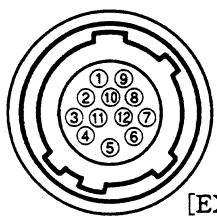
### RGB/SYNC (9P, FEMALE)



[EXT VIEW]

| No | Signal | Specifications |
|---|---|---|
| 1 | GND | |
| 2 | GND | |
| 3 | RED OUT | NTSC: 714 mVp-p, 75Ω<br>PAL: 700 mVp-p, 75Ω |
| 4 | GREEN OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, G SYNC:OFF |
| 5 | BLUE OUT | NTSC: 714 mVp-p, 75Ω<br>PAL: 700 mVp-p, 75Ω |
| 6 | VBS(Y) OUT | 1 Vp-p, 75Ω |
| 7 | SYNC(HD) OUT | NTSC: 2 p-p, 75Ω<br>PAL: 2 p-p, 75Ω |
| 8 | NC(HD IN) | NTSC: 2 p-p, 75Ω<br>PAL: 2 p-p, 75Ω |
| 9 | NC(VD I/O, C OUT) | VD: NTSC: 286 mVp-p, 75Ω<br>PAL: 300 mVp-p, 75Ω<br>C: NTSC: 286 mVp-p, 75Ω<br>PAL: 300 mVp-p, 75Ω |

### DC IN/SYNC/VIDEO (12P, MALE)



[EXT VIEW]

| | Sync signal | | | | | |
|---|---|---|---|---|---|---|
| | External sync signal | | | | Internal sync signal | |
| | HD, VD | | S, VS | | | |
| No | Signal | Specifications | Signal | Specifications | Signal | Specifications |
| 1 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 2 | +12V | +12 Vdc | +12V | +12 Vdc | +12V | +12 Vdc |
| 3 | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y |
| 4 | VBS/Y OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, sync negative | VBS/Y OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, sync negative | VBS/Y OUT | NTSC: 714 mVp-p<br>PAL: 700 mVp-p<br>75Ω, sync negative |
| 5 | GND(HD) | GND for HD | ——— | | ——— | |
| 6 | HD IN | 2 to 4 Vp-p, 75Ω | ——— | | ——— | |
| 7 | VD IN | 2 to 4 Vp-p, 75Ω | S/VS IN | 2 to 4 Vp-p, 75Ω | ——— | |
| 8 | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C |
| 9 | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT |
| 10 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 11 | +12V | +12 Vdc | +12V | +12 Vdc | +12V | +12 Vdc |
| 12 | GND(VD) | GND for VD | GND(S/VS) | GND for S/VS | ——— | |

## 2-4-2. Connector

When cable with connectors are set to the respective connectors on the connector panel during installation or service, the specified or equivalent connectors with cables, or the specified cable assemblies should be used, these are listed as follows ;

XC-999/999P

| Connector function | Parts No. and name of connector with cable |
|---|---|
| DC IN/SYNC/VIDEO (12P, MALE) | 1-562-356-11 CONNECTOR, 12P, FEMALE (HIROSE HR10-10PA-12S or equivalent) |
| LENS (3P, FEMALE) | 1-691-290-11 PLUG, 3P, MALE (HIROSE SR38-4P-3P or equivalent) |

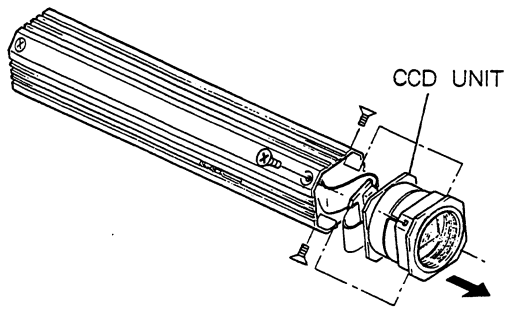
CMA-999/999P

| Connector function | Parts No. and name of connector with cable |
|---|---|
| Y/C (4P, FEMALE) | SONY cable "YC-15EV" or Super-VHS Cable HOSIDEN "TPX3630" or equivalent |
| RGB/SYNC (D-SUB 9P, FEMALE) | 1-566-354-11 D-SUB, 9P, MALE |
| CAMERA (12P, FEMALE) | 1-566-369-21 CONNECTOR, 12P, MALE (HIROSE HR10A-10P-12PC or equivalent) |
| DC IN/SYNC/VIDEO (12P, MALE) | 1-562-356-11 CONNECTOR, 12P, FEMALE (HIROSE HR10-10PA-12S or equivalent) |

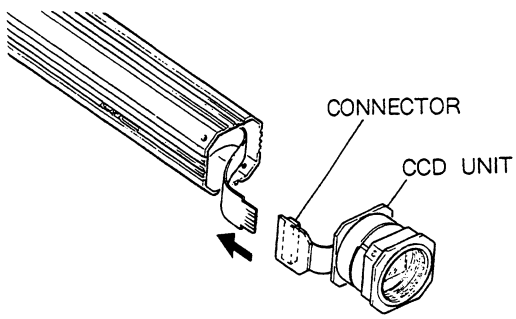
# SECTION 3
# SERVICE INFORMATION

## 3-1. REPLACEMENT OF CCD UNIT

1. Remove four screws from the front panel.
2. Pull out the CCD unit in the direction of arrow.




3. Disconnect the CCD unit from the TG-89/89P board and replace it with a new one.




4. Assemble the camera by reversing the above procedures.

# SECTION 4
# THEORY OF OPERATION

## 4-1. XC-999/999P THEORY OF OPERATION

### 4-1-1. CD-39 BOARD

The CD-39 board mounts a IC1 (CCD imager) that converts a light signal into an electric signal. Photosensors (light-sensitive devices) are arranged on the CCD chip surface. The 811/795 photosensors are arranged in the horizontal direction, and the 508/596 photosensors in the vertical direction (411,988/473,820 in total). The total number of effective pixels is 379,392/437,664 with 768/752 arranged in the horizontal direction and 494/582 in the vertical direction.

The incident light is converted into electric charges corresponding to the brightness of light using photosensor blocks. The converted electric charges are read from the photosensors to the transfer block, then sequentially transferred to the output block.

The transfer block consists of vertical transfer blocks and a horizontal transfer block. The number of vertical transfer blocks in the vertical direction of the screen is 811/795 as shown in Fig. 1. The number of horizontal transfer blocks in the horizontal direction of the screen (at the top in Fig. 1) is one. The electric charges that are converted using photosensors are transferred to the vertical transfer blocks adjacent to each photosensor for every field.

The electric charges that are transferred to each vertical transfer block are sent in parallel in the vertical direction using vertical transfer clocks V1 through V4 and sequentially transferred to the horizontal transfer block.

The horizontal transfer block transfers the electric charges in the horizontal direction using horizontal transfer clocks H1 and H2 (with a frequency of 910/908fH), then sends them to the output block.

The color coding of a color filter is shown in Fig. 2. During field read, electric charges are mixed through combination of A1 and A2 in field A and through combination of B in field B, as shown in Fig. 2. For line A1, the electric charges from the horizontal transfer block are thus transferred in the order of (G + Cy), (Mg + Ye), (G + Cy), and (Mg + Ye) signals. This signal is processed so that a proximity signal of a Y signal and chroma (color − difference) is formed. The proximity signal is produced by adding adjacent Y signals and by subtracting the adjacent chroma (color − difference) signals.

Proximity signal of the Y signal :

$Y = \{(G + Cy) + (Mg + Ye)\} \times \frac{1}{2} = \frac{1}{2}(2B + 3G + 2R)$

Proximity signal of the chroma (color-difference) signal:

$R - Y = \{(Mg + Ye) - (G + Cy)\} = (2R - G)$

For line A2, the signal from the horizontal transfer block is output in the order of (Mg + Cy), (G + Ye), (Mg + Cy), and (G + Ye). Using this signal, the Y signal and chroma (color-difference) signal are balanced because they are configured identically.

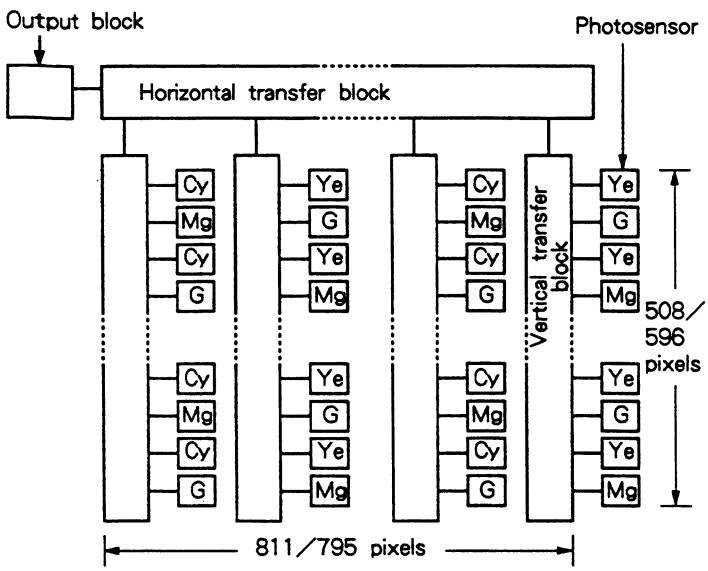



Fig. 1. Internal Structure of CCD (NTSC/PAL)

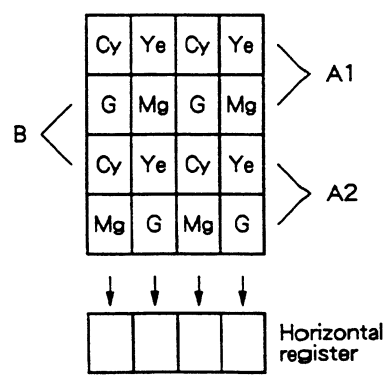



Fig. 2. Color Coding Table

Proximity signal of the Y signal :
$Y = \{(G + Ye) + (Mg + Cy)\} \times \frac{1}{2} = \frac{1}{2}(2B + 3G + 2R)$

Proximity signal of the chroma (color-difference) signal:
$-(B - Y) = \{(G + Ye) - (Mg + Cy)\} = -(2B - G)$

In the chroma (color − difference) signal, R − Y and − (B − Y) signals can be alternately extracted in linear sequence. Field B is also the same as field A.

The electric charges in the output signal of IC1 (CCD imager) are converted into a voltage signal using a capacitor in the output block, then output.
The signal is then output through buffer Q1 to the TG-89/89P board.



## 4-1-2. TG-89/89P BOARD

The TG-89/89P board consists of the followings :
(1) Sample and hold/AGC circuits
IC2 (CXA1390AR)
(2) CCD drive timing signal generator circuit
IC3 (CXD1252AR)
(3) CCD vertical transfer clock drive circuit
IC1 (CXD1250N)
(4) Sync/external sync signal generator circuits
IC5 (CXD1217M) and IC4 (CXD1216M)
(5) V SUB voltage supply/shutter control circuits
(6) Iris/AGC detector circuits
(7) 1820/1816fH oscillator circuit

(1) Sample and hold/AGC circuits
The signal output from a CCD imager on the CD-39 board branches into two paths; data and a PG signal. The data and PG signal are then sampled and held in their timing for signal separation.
The data and PG signal that are input to IC2 are sampled and held using XSHP and XSHD sample and hold pulses. The PG signal is sampled and held three times in the order of XSHP, XSHD, and XSHP. The data is sampled and held two times in the order of XSHD and XSHP. The difference between the sampled and held data and PG signal is extracted for signal separation. The separated signal is input to the AGC amplifier and detected using a detector circuit installed outside IC2 to ensure the proper value.

(2) CCD drive timing signal generator circuit
IC3 generates a clock, sample and hold pulse, and clamp pulse required for driving the CCD by inputting the horizontal drive (HD) and vertical drive (VD) pulses output from a 1820/1816fH oscillator circuit and sync signal generator circuit. The pulses described below are also output.

| | |
|---|---|
| • CL | : 910/908fH clock |
| • H1, H2 | : CCD imager H register drive pulse |
| • XV1 to XV4<br>XSG1, XSG2 | : CCD imager V register drive pulse. This pulse is output through drive circuit IC1 to the CD-39 board. |

- PG : Pre-charge gate pulse
- CLP1 to CLP4 : Various clamp pulses
- XSHP, XSHD : Sample and hold pulse for signal separation
- XSP1, XSP2 : Sample and hold pulse for color separation
- XSH1, XSH2 : Sample and hole pulse for Y signal recomposition
- XDL1, XDL2 : CCD 1H delay drive pulse for chroma signal
- XSUB : Electric charge sweep pulse for electronic shutter

(3) CCD vertical transfer clock drive circuit

The CCD vertical transfer clock drive circuit drives a CCD imager V register drive pulse. This circuit drives the XV1 through XV4, and XSG1,XSG2 and XSUB pulses output from IC3 and sends them to the CD-39 board.

(4) Sync/external sync signal generator circuits

IC4 and IC5 generate various timing signals required to produce an NTSC or PAL video signal by inputting a CL (910/908fH) clock. The timing signals are as follows :

- SYNC : Composite sync signal
- BLK : Blanking signal
- HD, VD : Horizontal and vertical sync signals
- FLD : Field signal
- BF : Burst flag signal
- INT/EXT : Sync mode selection signal.
  INT (Internal sync) mode: Low
  EXT (External sync) mode: High
- H COMP OUT : 1820/1816fH oscillator circuit control voltage output

(5) V SUB voltage supply/shutter control circuits

1. V SUB voltage supply circuit

The V SUB voltage supply circuit primarily consisting of Q1 is used to supply a specified voltage to the CCD imager overflow drain. Q1 and Q2 are a regulator with the V SUB control voltage as reference voltage.

The V SUB control voltage can be changed in the range of about 1.6 to 5.0V using RV1 and is set so that the CCD imager overflow drain voltage (at pin 4 of V SUB) is the same as the specified voltage. This voltage value is displayed on the back of the CCD imager using a code.

2. Shutter control circuit

The electronic storage time can be controlled by adding an electric charge sweep pulse to the overflow drain DC bias (V SUB) of the CCD imager.

Electric charge sweep pulse X SUB is inverted and amplified using IC1, added to the V SUB DC voltage, and input to pin 4 of the CCD imager.

(6) Iris/AGC detector circuits

The CCD iris detector circuit primarily consists of Q7. The auto iris detection output signal is output from pin 17 of IC2 to the CN-519 board as a video signal (not including a sync signal). The AGC detector circuit primarily consists of Q5. This circuit establishes an AGC loop together with an operational amplifier in IC2.

(7) 1820/1816fH oscillator circuit

A oscillating inverter is incorporated between pins 1 and 2 of IC3. A crystal oscillator and load capacity are connected to the oscillating inverter to constitute a voltage – controlled crystal oscillator (VCXO).

The frequency control voltage of this oscillator circuit is output from pin 9 (H COMP OUT) of IC4.

## 4-1-3. PR-153/153P BOARD

The PR-153/153P board consists of the following :

(1) Signal processing circuit
IC301 (CXL1507N)
IC302 (CXA1391R)
IC303 (CXL5504M)
Chroma signal matrix circuit
Y signal processing circuit
(2) Encoder circuit
IC304 (CXA1392R)
(3) Chroma signal comb filter circuit
IC305 (CXL5504M) and its peripheral circuit

### (1) SIGNAL PROCESSING CIRCUIT

Chroma signal matrix circuit

1. C0 and Y0 signals separation
The C0 signal (2R − G or G − 2R) and Y0 signal (2R + 3G + 2B) are separated from an S1 signal (G + Cy or Mg + Ye) and S2 signal (Mg + Cy or G + Ye).
These signals are used for R, G, and B signal matrixing.
• The C0 signal is produced by subtracting the S1 signal from the S2 signal.

In a (G + Cy) / (Mg + Ye) line :
C0 = (Mg + Ye) − (G + Cy)
= (R + B + R + G) − (G + G + B)
= 2R − G

In a (Mg + Cy) / (G + Ye) line :
C0 = (G + Ye) − (Mg + Cy)
= (G + R + G) − (R + B + G + B)
= − (2B − G)

Therefore, 2R − G and − (2B − G) signals are alternately obtained in linear sequence.

The Y0 signal is produced by adding the S2 and S1 signals. As shown in the following equation, they are balanced with the same configuration in any line.

Y0 = (Mg + ye) + (G + Cy)
= (R + B + R + G + G + G + B)
= 2R + 3G + 2B

2. C1 signal generator circuit
The C0 signal is a linear sequence signal of 2R − G (CR) and − (2B − G) (CB) signals. CR and CB signals are simultaneously required to matrix and produce R, G, and B signals. Therefore, this signal is produced by producing 1H − delayed signal C1 and by adding the C0 and C1 signals to it.
The C0 signal is output in reverse polarity from pin 46 of IC302. The resultant signal is input to pin 23 of IC301 and 1H − delayed using a CCD delay line to produce the C1 signal. The drive clock of the CCD 1H − delay line is XDL1 and XDL2, and its frequency is 455/454fH (7.16 MHz). The C0 signal thus has a sufficient sampling frequency for a chroma signal.
The C1 signal is output in reverse polarity from pin 14 of IC301. The signal is then input through buffer Q303 to pin 48 of IC302 and output through a gain control amplifier to the RGB matrix circuit. In the gain control circuit, the C1 signal level is set so that it is equal to the C0 signal level using the voltage at pin 47 of IC302.

3. Y1 and Y2 signal creating circuit
Y0, Y1, and Y2 signals are required to produce a V aperture signal. The Y0 and Y1 signals are used as a Y signal for R, G, and B signal matrixing.
The Y0 signal is output in positive polarity from pin 52 of IC302. The signal is then input to pin 3 of IC301 and 1H − delayed using a CCD 1H delay line to produce the Y1 signal. The drive clock frequency of the CCD 1H delay line is 455/454fH (7.16 MHz). The Y0 signal has thus a sufficient sampling frequency for a Y signal that is used for R, G, and B signal matrixing or a V aperture signal.
The Y1 signal is output in reverse polarity from pin 11 of IC301. The signal is then input through buffer Q302 to the pin 55 of IC302 and passed through the gain control amplifier. The resultant signal is added to the Y0 signal and output to the matrix circuit.
In the gain control circuit, the Y1 signal level is set so that it is equal to the Y0 signal level using the voltage at pin 54 of IC302.
The Y2 signal is also produced by delaying the Y1 signal by 1H still more.

4. RGB matrix circuit

The R, G, and B signals are produced from C0, C1, and Y0 + Y1 signals to process a primary color signal.

- Two continuous signals CR and CB are produced from C0 and C1 signals (linear sequence signals of CR and CB signals).

When C1 signal is CR signal.

The CB signal is used as the C0 signal. The CR (C1) and CB (C0) signals become one by adding the C1 and C0 signals.

When C1 signal is CB signal.

The CR signal is used as the C0 signal. The CB (C1) and CR (C0) signals become one by adding the C1 and C0 signals.

- Y signal used for R, G, and B signal matrixing is produced by adding Y0 and Y1 signals.
- The R, G, and B signals are produced from CR, CB, and Y signals.

R signal :

$R = CR + \alpha \cdot Y$

where, value $\alpha$ is set using the voltage at a pin of IC302.

B signal :

$B = -CB + \beta \cdot (Y - CR)$

where, value $\beta$ is set using the voltage at a pin of IC302.

G signal :

$G = Y - CR + CB$

5. White balance circuit

The R, G, and B signals produced by the RGB matrix circuit, are processed using the white balance circuit so that they are white-balanced with respect to the color temperature of the subject that a camera shoots.

The R and B signals are first input to variable gain amplifiers, and the G signal is input to a fixed gain amplifier. The gain of the variable gain amplifiers is set to the white balance in the INDOOR mode (at color temperature of 3200K) Using the voltage (R GAIN) at pin 37 of IC302 and voltage (B GAIN) at pin 40.

The R and B signals are then input to second-stage variable gain amplifiers, and the G signal is input to a second-stage fixed gain amplifier. The second-stage variable gain amplifiers are controlled using the voltage (R CONT) at pin 38 of IC302 and the voltage (B CONT) at pin 39. These voltages are output from the EN-97/97P board.

6. ATW circuit

After the white balance detection signals WBR, WBG and WBB, that are output from IC302, are detected, the R and G detection voltages are compared to the G detection voltage using an operational comparator IC306. The R and B signals are made coincide with the G signal to set the white balance properly.

7. Gamma compensator circuit

R, G, and B signals are processing using the gamma compensator circuit and sent to the color-difference matrix circuit in the next stage.

8. Color-difference matrix circuit

Color-difference signals must be produced to produce an NTSC or PAL color signal. The color-difference matrix circuit also adjusts the color reproduction.

The color-difference matrix circuit produces the color-difference signals in accordance with the expression below.

$R - Y = 0.7\ (R - G) - 0.11\ (B - G)$

$B - Y = 0.3\ (R - G) - 0.89\ (B - G)$

Hue compensation signals R − Y HUE and B − Y HUE are added to color-difference signals R − Y and B − Y. The resultant signals are output to pins 20 and 19 of IC302.

Y Signal Processing Circuit

The $Y_H$ signal output from the TG-89/89P board is input through low-pass filter FL301 and delay line FL302 to pin 64 of IC302.

1. Gamma compensator circuit
   The $Y_H$ signal is processed using the gamma compensator circuit and sent to the $Y_H$ signal 1H-delay circuit in the next stage.

2. $Y_H$ signal 1H-delay circuit
   The $Y_H$ signal 1H-delay circuit primarily consisting of IC303 is inserted to compensate for the delay in a chroma signal channel relative to the $Y_H$ signal.
   The H aperture Y signal passed through a comb filter is produced using a 1H-delayed $Y_H$ signal. The $Y_H$ signal output from pin 4 of IC302 is input to pin 1 of IC303. The signal is then passed through a CCD delay line and sent to external low-pass filter FL303 (230 nsec delay line) so that it is delayed by 1H. The CCD delay line drive clock frequency is 910/908$f_H$.

3. $Y_H$ signal gain adjustment circuit
   The $Y_H$ signal is input again to pin 2 of IC302. The gain that is attenuated using a $Y_H$ signal 1H-delay circuit is compensated using the gain adjustment circuit. The input signal at pin 2 is output from pin 5 and input through Y/C phase adjustment delay line FL304 (70 nsec) to encoder IC304.

(2) ENCODER CIRCUIT

Chroma Signal Encoder Circuit

The encoder circuit is used to encode R-Y and B-Y color-difference signals into an NTSC or PAL chroma signal.

The R-Y signal is balanced and modulated using a +90-degree phase carrier, with the burst added. The B-Y signal is balanced and modulated using a 0-degree phase carrier, with the burst added.

The modulated R-Y and B-Y signals are added to produce a cross modulation wave and are output from pin 16 of IC302. The signals are then passed through a chroma comb filter circuit block primarily consisting of IC305, sent to the external 3.58/4.43 MHz bandpass filter, then input again to pin 18 of IC302. At last, signals are mixed with a luminance signal and output from pin 21 as a composite video signal.

Y Signal Encoder Circuit

1. Aperture compensator circuit
   The aperture compensator circuit emphasizes the contour of a video signal and improves the resolution visually. The vertical lines on the screen are emphasized using an H aperture signal, and the horizontal lines on the screen using a V aperture signal.
   The H and V aperture compensation signals are added to the YH signal that is input to pin 40 of IC304. The resultant signal is output to the next stage.
   The H aperture compensation signal is produced using delay line FL306. Delay line FL306 employs a 70 nsec group delay similarly to FL304. The H aperture compensation signal is level adjusted using a pin 36 voltage, noise sliced, and added to this signal. In a low-illuminance subject, the voltage at pin 36 of IC304 is raised using an AGC CONT voltage. This increases the setting voltage. The H aperture compensation signal level is then degraded, and noise is reduced. The noise slice level is also set using the voltage at pin 38.
   The V aperture signal is produced using IC302 and input through Y signal phase adjustment delay line FL305 to IC304. The signal is then added to a Y signal.

2. Y gain circuit
   The Y gain circuit sets the Y signal output level of a camera to the specified value. The output level is adjusted by RV314.

3. White clip circuit
   The white clip circuit limits the Y signal peak value of a camera. The peak value is preset using a fixed resistor.

4. Setup circuit
   The setup circuit sets the Y signal black level of a camera to the specified value. The black level is adjusted using RV313.

5. Sync signal adder circuit
   A sync signal is added to the Y signal of a camera using the sync signal adder circuit and mixed with a chroma signal in the later stage. The mixed signal is output from pin 21 as a composite video signal.

(3) CHROMA SIGNAL COMB FILTER CIRCUIT

The chroma signal comb filter circuit primarily consists of IC305. This circuit eliminates the crosstalk components contained in a Y signal from the chroma signal.

## 4-1-4. EN-97/97P BOARD

The EN-97/97P board mounts a DC-to-DC convertor that supplies the DC power required for the circuit blocks on each board. This board also mounts the circuit blocks below.

(1) External sync separation circuit
(2) Video signal drive circuit
(3) Mode selection circuit
(4) CCD Iris circuit

(1) External sync separation circuit

An external sync signal is sync-separated using a circuit consisting of Q601 through Q603, IC607 through IC609, and IC617 when it is input. The signal is then output to the PR-153/153P board.

The FH signal for phase comparison sent from the PR-153/153P board is phase-adjusted using a monostable multivibrator IC625 and output to the PR-153/153P board.

The FH pulse is produced as a 2FH pulse using a circuit consisting of Q607, IC626, and IC627 and sent to the CK input pin of shift register IC608. IC608 delays the phase of the VD pulse when HD and VD pulses are synchronized externally, then outputs it to the PR-153/153P board.

(2) Video signal drive circuit

The VBS, Y/C, and R-Y and B-Y signals sent from the PR-153/153P board are selected using analog switches IC612 and IC613 and are output through video drive circuits IC614 and IC615 to the CN-519 board. The Y, R-Y, and B-Y signals are automatically output when The CMA-999/999P is connected.

(3) Mode selection circuit

The modes below can be switched by selecting a switch S601 and analog switches IC610 and IC606.

AGC ..... ON/OFF
White balance ..... 3200K/5000K/ATW/MANUAL
Shutter mode ..... OFF/$\frac{1}{1000}$/FL/CCD IRIS

(4) CCD Iris circuit

The CCD iris circuit can have the same function as in an auto iris lens by controlling the shutter speed automatically according to the light intensity of an object.

The IRIS DET signal input from the PR-153/153P board is converted into a DC voltage and amplified using IC624.

A reference comparison waveform during V period is produced using a circuit primarily consisting of IC601, IC605, Q604, and Q605. The two signals above are compared using IC623. This output signal is input to an X SUB generator circuit consisting of IC620 through IC622 and IC604 and sent to the PR-153/153P board.

# 4-2. CMA-999/999P THEORY OF OPERATION

## 4-2-1. SG-185/185P BOARD

The SG-185/185P board mounts a DC-to-DC convertor that supplies the Dc power required for the circuit blocks on each board. This board also mounts the circuit blocks below.

(1) Sync signal generator circuit
(2) External sync circuit

(1) Sync signal generator circuit
IC15 generates various timing signals by inputting a CL (910fH) signal and 4 fsc signal.

| | |
|---|---|
| • SYNC | Composite sync signal |
| • BLKG | Blanking signal |
| • HD, VD | Horizontal and vertical sync signals |
| • BF | Burst flag signal |
| • SC | Subcarrier signal |

(2) External sync circuit
The VBS signal input from the external source is separated into a sync signal and chroma signal. The sync signal is selected using analog switch IC3 and sent to a genlock circuit IC14. The sync signal is separated into HR and VR signals using IC14. The VR signal is directly input to IC15. The FH signal of IC15 is phase-adjusted using a monostable multivibrator IC5 and input to IC14. The phase adjustment is performed using RV3 on the CN-517 board. The FH signal is phase-compared with a HR signal inside IC14. The comparison output signal is passed through a low-pass filter to produce a CL VCO control voltage. The chroma signal is amplified and input to IC14. The input signal of IC14 is phase-compared with an internal SC signal from IC15. The comparison output signal is passed through a low-pass filter to produce a 4 fsc VCO control voltage. The SC signal is phase-adjusted using IC6 and switched into 0 or 180 using IC8. The switched signal is then passed through a low-pass filter and bandpass filter and output to the EN-98/98P board. The phase adjustment is performed using RV2 on the CN-517 board. The 0/180 selection is performed using switch S1 on the CN-517 board.

## 4-2-2. EN-98/98P BOARD

The EN-98/98P board generates VBS, Y/C, and R, G, and B signals from The Y, R-Y, and B-Y signals that are input from XC-999/999P. This board also outputs sync, HD, and VD signals via a 75-ohm driver. The R-Y and B-Y signals input from the CN-516 board are amplified using IC1 and input through a delay line to encoder IC7. A Y signal is input through a buffer to IC7. The signal is then passed through a matrix circuit inside IC7 and output as R, G, and B signals. The output signal is also passed through a white clip and setup circuits and output through a 75-ohm driver to the CN-516 board. The sync signal is mixed with only the G signal.
An SC signal is input to IC7 to modulate the R-Y and B-Y signals, then output as a chroma signal. A chroma signal is passed through a cleaning circuit. The chroma signal is then mixed with the Y signal passed through a delay line to produce a VBS signal and output via a 75-ohm driver. For NTSC only, the chroma signal is passed through a comb filter. The Y and C signals are output through a 75-ohm driver as a Y/C signal.

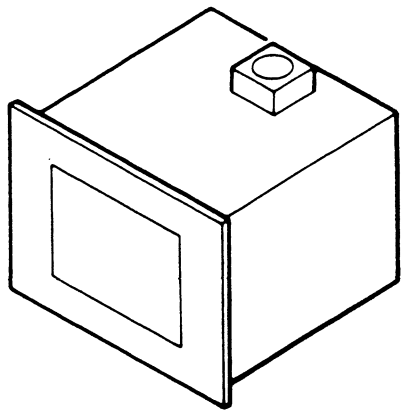
# SECTION 5
# ALIGNMENT

## 5-1. PREPARATION

### 5-1-1. Fixtures and Equipment

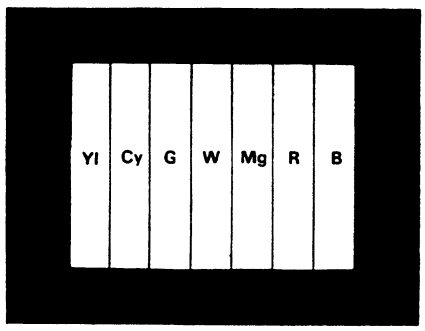
| J-6029-140-A | Pattern Box PTB-500 |
|---|---|

• Light source for test chart

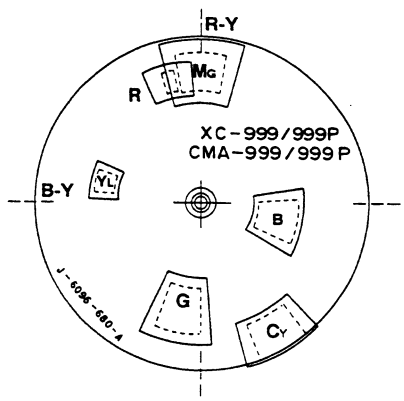


| J-6020-250-A | Color Bar Chart |
|---|---|

• For color adjustment

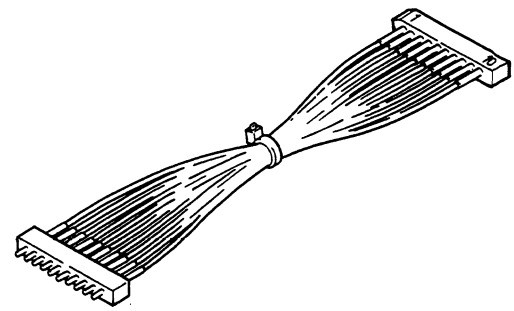



| J-6096-680-A | Vectorscope Scale |
|---|---|



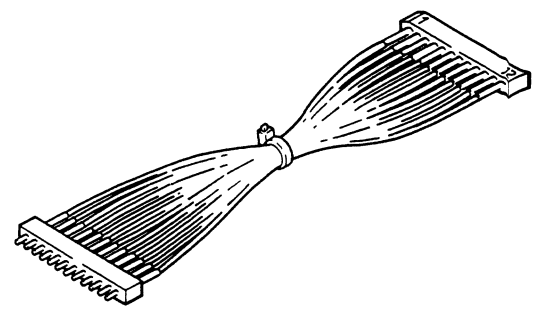

| J-6096-610-A | Extension Harness (10P) |
|---|---|

• For EN-98/98P board extension



| J-6096-620-A | Extension Harness (12P) |
|---|---|

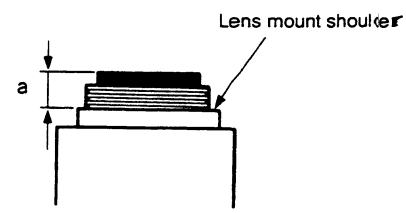
• For EN-98/98P board extension



Commercial measuring equipment and fixture

- Dual Trace Oscilloscope
- Frequency Counter
- Vectorscope
- Digital Voltmeter
- Waveform Monitor (WFM)
- Color Monitor
- Lens (C mount and manual iris type)

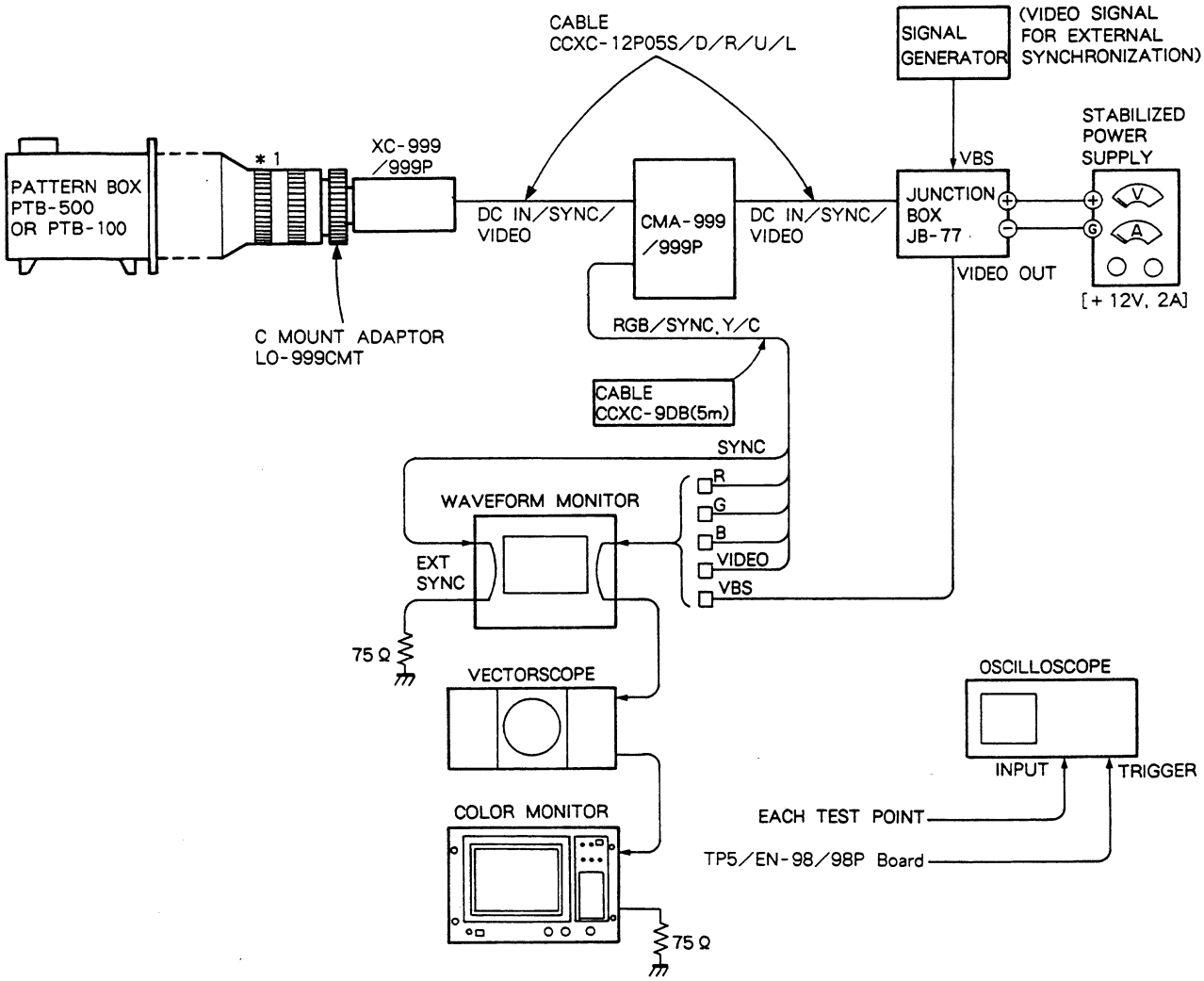
(By using the LO-999CMT C-mount lens adaptor, you can mount any 1/2-inch C-mount lens that does not project more)




Note : a should be under 4.1 mm.

## 5-1-2. Connection for Adjustment

In adjustment, use the conventional DC power (DC12V) and Junction Box (JB-77) connecting as shown below.




Note : *1

a) In this manual, adjustment is performed using the camera with a C-mount type and manual iris control lens attached. The C-mount type lens can not be attached without the LO-999CMT.

b) If a lens VCL-06S12XM or VCL-12S12XM is used, the distance between the lens and pattern box should be shorted. In this case, actual waveform pictures are a little different from those shown in this manual.

## 5-2. CMA-999/999P ALIGNMENT

PREPARATION :
1. Prepare the XC-999/999P.
2. Align the white level for 100 IRE (NTSC) /700mV (PAL) in shooting the color-bar standard picture frame.
3. Connect the XC-999/999P with the CMA-999/999P.

### 5-2-1. VCO Control Voltage Adjustment

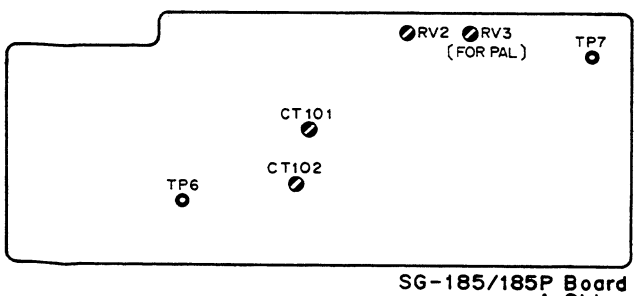
Equipment : Digital voltmeter
Preparation :
1. Extend the EN-98/98P board using Extension Harnesses (10P, 12P).
2. Input the VBS signal.

Adjustment Procedures :
1. Test Point : TP6 : SG-185/185P board
   Adj. Point : ⊘CT101 : SG-185/185P board
   Specification : 3.2 ± 0.05 Vdc
2. Test Point : TP7 : SG-185/185P board
   Adj. Point : ⊘CT102 : SG-185/185P board
   Specification : 3.0 ± 0.05 Vdc

Note : After adjustment, remove the Extension Harness (10P, 12P) and install the EN-98/98P board.

### 5-2-2. INT SC Frequency Adjustment

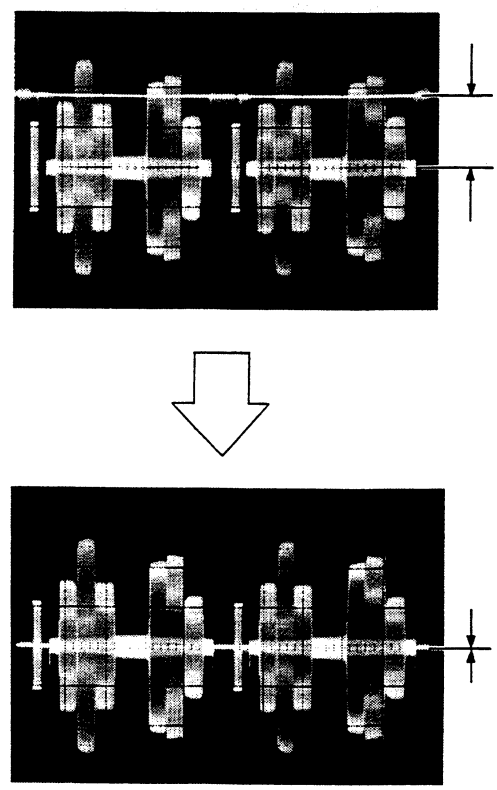
Equipment : Frequency counter
< NTSC >
Test Point : TP4 : EN-98 board
Adj. Point : ⊘RV2 : SG-185 board
Specification : 3.579545MHz ± 10Hz
< PAL >
Test Point : TP4 : EN-98P board
Adj. Point : ⊘RV3 : SG-185P board
Specification : 4.433618MHz ± 10Hz

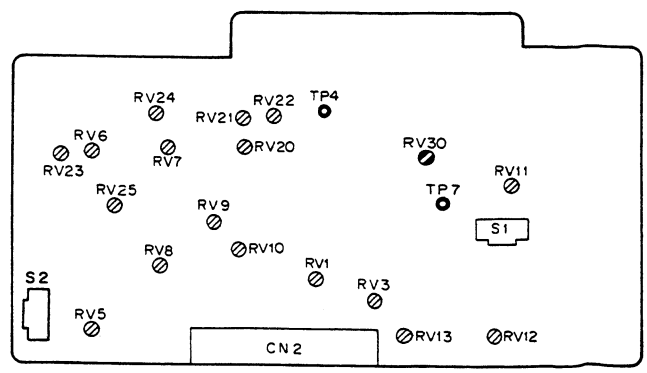


SG-185/185P Board
-A Side-

### 5-2-3. Chroma BLKG Cleaning Adjustment

Equipment : Oscilloscope
Test Point : TP7 : EN-98/98P board
Adj. Point : ⊘RV30 : EN-98/98P board
Specification : Adjust ⊘RV30 so that the level difference during BLKG period is minimum.

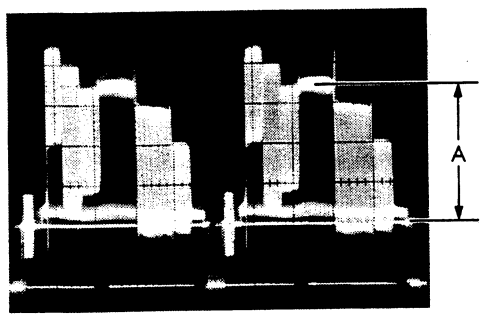




EN-98/98P Board
-A Side-

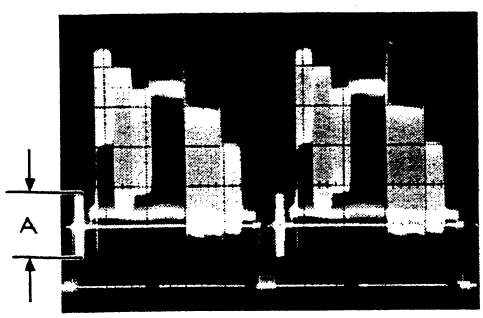
## 5-2-4. VBS OUT Level Adjustment

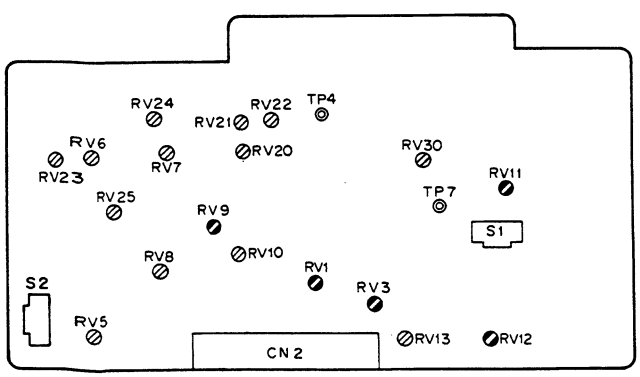
Equipment : Waveform monitor
Preparation : S1 : EN-98/98P board → OFF
Test Point : VBS OUT
Adj. Point : ◐RV9 : EN-98/98P board
Specification :
NTSC ; A = 100 ± 2 IRE
PAL ; A = 700 ± 15 mV




## 5-2-5. Burst Level Adjustment

Equipment : Waveform monitor
Test Point : VBS OUT
Adj. Point : ◐RV12 : EN-98/98P board
Specification :
NTSC ; A = 41 ± 1 IRE
PAL ; A = 305 ± 5 mV

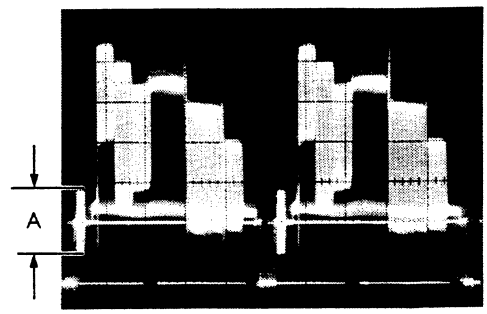



EN-98/98P Board
-A Side-

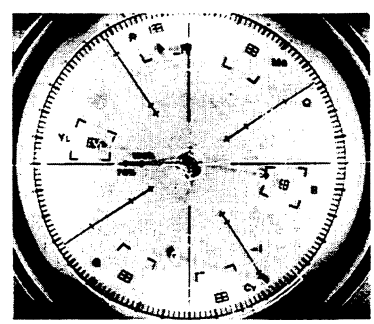
## 5-2-6. Burst Level Adjustment 2 (NTSC only)

Equipment : Waveform monitor
Preparation : S1 : EN-98 board → ON
Test Point : VBS OUT
Adj. Point : ◐RV11 : EN-98 board
Specification : A = 41 ± 1 IRE



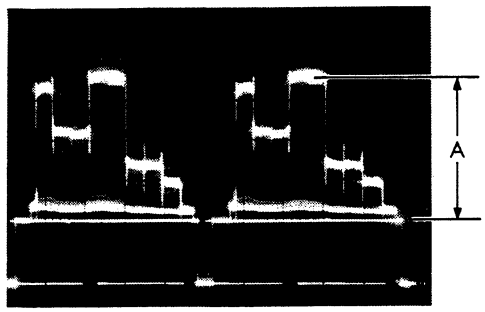

## 5-2-7. Color Reproducibility Adjustment

Equipment : Vectorscope
Test Point : VBS OUT
Adj. Point : ◐RV1, ◐RV3 : EN-98/98P board
Specification : Adjust ◐RV1 and ◐RV3 so that each beam spot should be positioned inside the color reproducibility frame in shooting the color-bar standard picture frame.



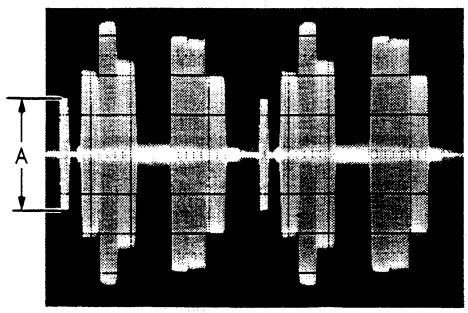
## 5-2-8. Y Level Adjustment

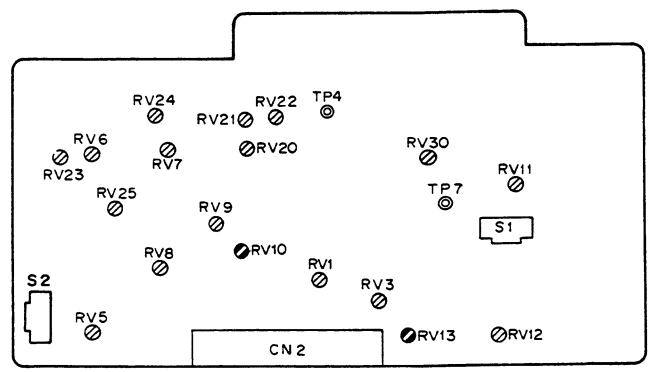
Equipment : Oscilloscope
Test Point : CN2-pin 17(GND:pin 1)/EN-98/98P board
Adj. Point : ⊘RV10 : EN-98/98P board
Specification :
NTSC ; A = 714 ±15 mV (75-ohm termination)
PAL ; A = 700 ±15 mV (75-ohm termination)




## 5-2-9. Chroma Level Adjustment

Equipment : Oscilloscope
Test Point : CN2-pin 19(GND:pin 1)/EN-98/98P board
Adj. Point : ⊘RV13 : EN-98/98P board
Specification :
NTSC ; A = 300 ±5 mV (75-ohm termination)
PAL ; A = 300 ±10 mV (75-ohm termination)




EN-98/98P Board
-A Side-

## 5-2-10. R/G/B OUT Adjustment

Equipment : Waveform monitor
Adjustment Procedures :

1. SETUP level adjustment
Preparation : Close the lens iris.
Adjustment : Adjust every channel as shown below.

EN-98/98P board

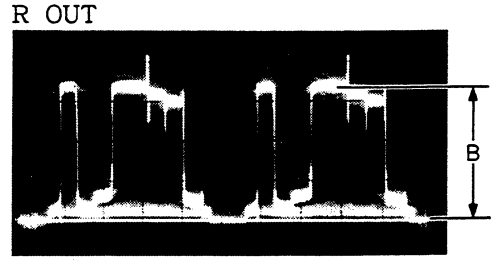
| | TEST POINT | ADJ. POINT | SETUP LEVEL |
|---|---|---|---|
| R-ch | R OUT | ⊘RV23 | A = 4 ± 1 IRE<br>A = 30 ± 10 mV |
| G-ch | G OUT | ⊘RV24 | |
| B-ch | B OUT | ⊘RV25 | |

2. VIDEO OUT level adjustment
Object : Color bars chart
Preparation : Adjust iris control so that the VBS OUT level is 100IRE (NTSC) /700mV (PAL).
Adjustment : Adjust every channel as shown below.

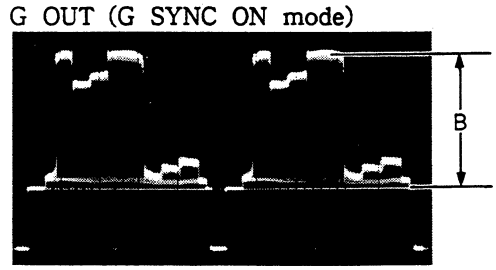
EN-98/98P board

| | TEST POINT | ADJ. POINT | WHITE LEVEL |
|---|---|---|---|
| R-ch | R OUT | ⊘RV6 | B = 100 ± 2 IRE<br>B = 700 ± 15 mV |
| G-ch | G OUT | ⊘RV7 | |
| B-ch | B OUT | ⊘RV8 | |

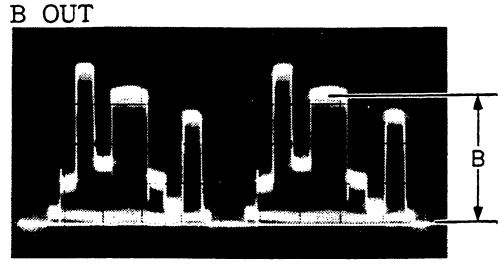
R OUT




G OUT (G SYNC ON mode)



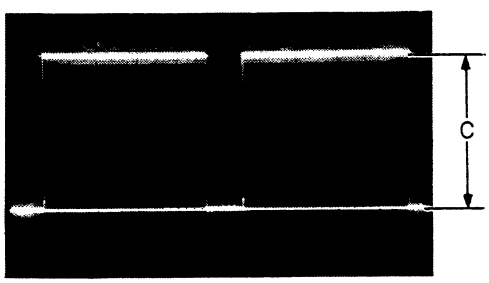

B OUT



3. White clip adjustment
Object : Overall white
(white portion of the pattern box)
Preparation : Open the lens iris. Shoot the fully-occupied white pattern.
Adjustment : Adjust every channel as shown below.

EN-98/98P board

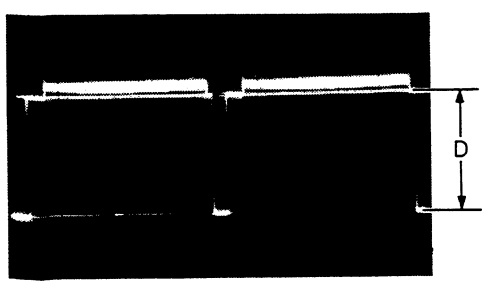
| | TEST POINT | ADJ. POINT | WHITE CLIP LEVEL |
|---|---|---|---|
| R-ch | R OUT | ⊘RV20 | C = 110 ± 5 IRE<br>C = 800 ± 30 mV |
| G-ch | G OUT | ⊘RV21 | |
| B-ch | B OUT | ⊘RV22 | |

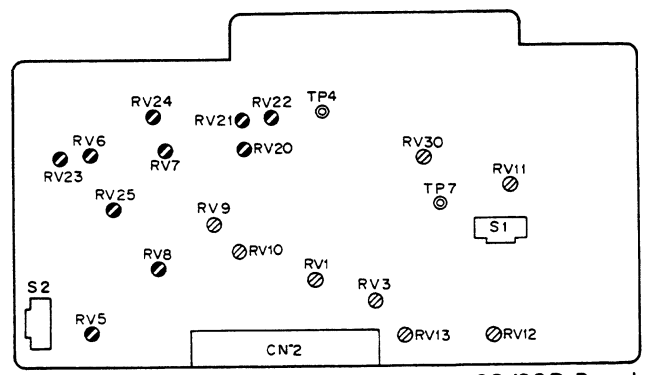



4. G OUT SYNC level adjustment

Note : Perform the adjustment only when setting the G SYNC ON/OFF mode to "ON".

Equipment : Waveform monitor
Test point : G OUT
Preparation : Close the lens iris.
Adj. Point : ⊘RV5 : EN-98/98P board
Specification :
NTSC ; D = 40 ± 1 IRE
PAL ; D = 300 ± 10 mV




EN-98/98P Board
-A Side-

• Some boards may have the S2 switch.
In such a case, the ON/OFF of superimposing SYNC signal to the GREEN OUT can be selected by its switch. (ON : SYNC ON, OFF : SYNC OFF)

• When your EN-98/98P board doesn't have the S2 switch, the ON/OFF of superimposing the SYNC signal to the GREEN OUT can be selected by changing mode select jumpers (chip resistor) as follows.

| Mode | EN-98/98P board (B side) |
|---|---|
| SYNC ON | JR3 : OPEN<br>JR4 : M't (Mode select jumper) |
| SYNC OFF | JR3 : M't<br>JR4 : OPEN (Mode select jumper) |

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# 第1章
# 取り扱い操作

## 1-1. 特長および使用上の注意

### 特長

XC-999は、1/2インチのCCD(Charge Coupled Device)を採用した超小型カラーカメラモジュールです。

**超小型・軽量**
従来のカメラと比べ非常に小型になっていますので、今まで設置不可能だった場所にも設置可能です。

**高感度**
HYPER HAD(Hole Accumulated Diode)センサーの採用により、高感度、低スミアを実現。照明条件の悪い場所でも撮影が可能です。

**高解像度**
有効画素数が約38万画素のCCDにより、きめ細かな画像を再現します。

**4種類のホワイトバランスモード**
ホワイトバランスモード設定用DIPスイッチの設定を変えることにより、3200K/5600K/ATW/MAN(手動)の4種類のホワイトバランスモードの中から照明条件に応じた設定ができ、適切な色調が選べます。

**電子シャッタースピード機能**
電子シャッタースピード設定用DIPスイッチの設定を変えることにより、OFF/1/1000/FLICKERLESSの3段階のシャッタースピードの中から、撮影条件に合った速度が選べます。
DIPスイッチをCCD IRIS機能の設定にすると、入射光量に応じて自動的にシャッタースピード調整を行い、映像信号を適正なレベルに保ちます。

### 使用上の注意

**取り扱い**
内部に水などの液体をこぼしたり、燃えやすいものや金属類を落としたりしないでください。そのまま使用すると、火災や感電、故障、事故の原因となります。

**使用・保管場所**
非常に明るい被写体(照明や太陽など)を長時間にわたって撮影しないでください。
また、次のような場所での使用および保管は避けてください。
- 極端に暑い所や寒い所(使用温度は0℃～40℃)
- 湿気、ほこりの多い場所
- 雨のあたる所
- 激しく振動する所
- 強い電波を発するテレビやラジオの送信所の近く

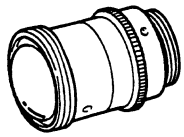
**レンズの取り付け**
レンズは、取り付けかたを誤ると損傷することがあります。「レンズの取り付け方法」(1-8(J)ページ)をお読みのうえ、取り付けてください。

**お手入れ**
- レンズや光学フィルターの表面に付いたごみやほこりは、ブロアーで払ってください。
- キャビネットの汚れは、乾いたやわらかい布でふきとります。ひどい汚れは、中性洗剤溶液を少し含ませた布でふきとった後、からぶきします。
- アルコール、ベンジン、シンナーなどは、表面が変質したり塗料がはがれる原因となりますので、使わないでください。

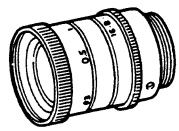
## 1-2. 別売専用アクセサリー

多彩な専用アクセサリーで高性能なシステム構成が可能となります。
本機と一緒に組み合わせてお使いいただく別売りのアクセサリーは次の通りです。

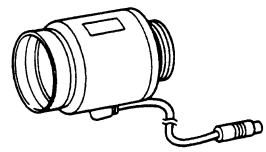
**レンズおよびレンズアクセサリー**



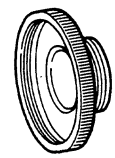
スペシャルMTレンズ
VCL-03S12XM（f=3.5mm）



スペシャルMTレンズ
VCL-06S12XM（f＝6mm）
VCL-12S12XM（f＝12mm）

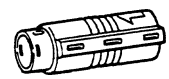


スペシャルMTレンズ
VCL-7S12XEA（f＝7mm）



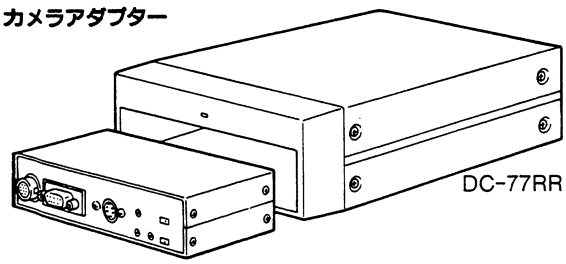
Cマウントアダプター
LO-999CMT

接写リングキット
LO-999ERK



オートアイリス用レンズプラグ
PC-XC03

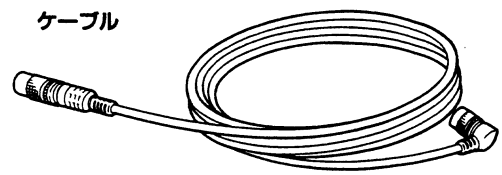
**カメラアダプター**



DC-77RR

RGBアダプター
CMA-999

**ケーブル**



カメラケーブル12P-12P
CCXC-12P05S/D/R/U/L

各アクセサリーの機能を簡単に説明します。

### RGBアダプター CMA-999

RGBアダプターには次の機能があります。

- RGB出力(D-SUB9ピン)およびY(輝度信号)／C(色信号)出力(S端子)機能
- ゲンロック機能
- 露光時間コントロール機能

カメラアダプターDC-77Rに組み込んで使うこともできます。
またジャンクションボックスJB-77に接続しても使用できます。

### スペシャルMTレンズ VCL-12S12XM(f=12mm)
### スペシャルMTレンズ VCL-06S12XM(f=6mm)
### スペシャルMTレンズ VCL-03S12XM(f=3.5mm)

本機専用のマニュアルアイリスレンズです。

### マウントアダプター LO-999CMT

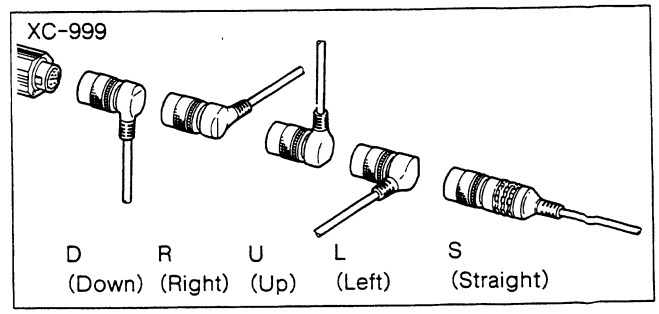
本機に従来のCマウント式レンズ(レンズマウント面からの飛び出し量が4.1mm以下のもの)を取り付けるためのレンズマウントアダプターです。

### 接写リングキット LO-999ERK

本機専用の接写リングキットです。

### カメラケーブル12P-12P CCXC-12P05S/D/R/U/L

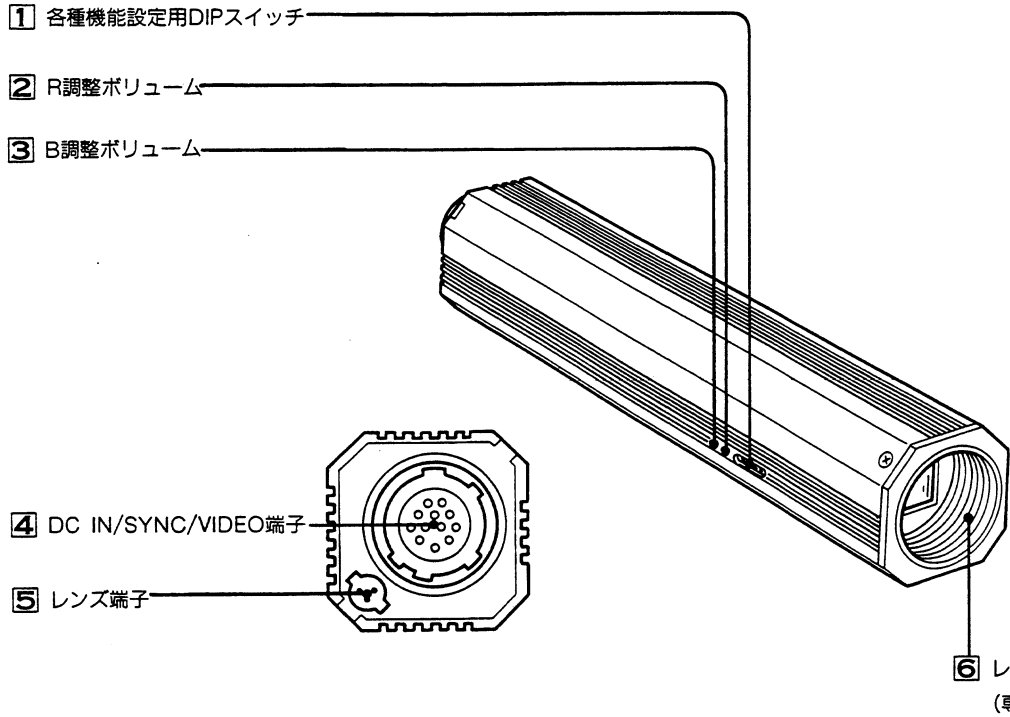
XC-999シリーズで使用するケーブルです。ケーブルの引出し方向が異なります。各ケーブルの引出し方向を変えることはできません。



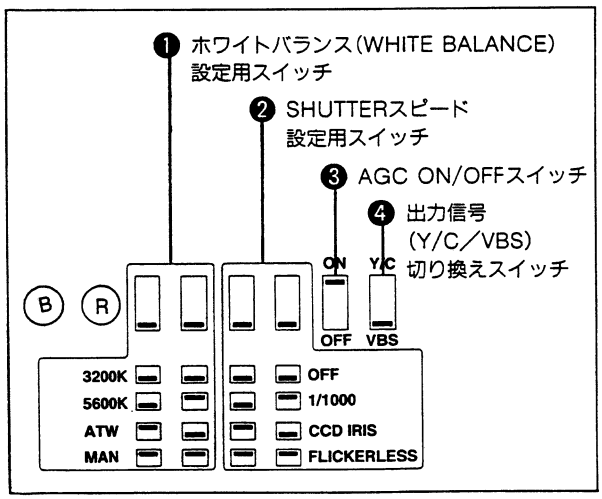

### オートアイリスレンズ用プラグ PC-XC03

## 1-3. 各部の名称と働き

### カラービデオカメラモジュールXC-999




#### 1 各種設定用DIPスイッチ




**❶ホワイトバランス(WHITE BALANCE)調整用スイッチ**

撮影条件(光源)に合わせて、次の4種類のモードが設定できます。

**3200K**(固定モード):室内の白熱灯下での撮影に適しています。(工場出荷時の設定)

**5600K**(固定モード):晴天の屋外での撮影に適しています。

**ATW**(オートトレーシングホワイトバランス):色温度の推移にともなってホワイトバランスが自動調整されます。撮影時の光源が、例えば朝の光から夕方の光に変化する場合などに適しています。

**MAN**(マニュアル):R調整ボリュームと、B調整ボリュームで赤系・青系を好みの色合いに調整するときに、この位置にします。

**❷SHUTTERスピード設定用スイッチ**

撮影条件に応じたシャッタースピードに設定します。またCCD IRIS機能を使用する場合は、CCD IRISモードに設定します。

**OFF**:1/60秒(工場出荷時の設定)

**1/1000**:1/1000秒

**CCD IRIS**:CCD IRISモードに設定します。RGBアダプターの露光時間コントロール機能を使用するときは、必ずこの位置にします。

**FLICKERLESS**:1/100秒

**❸AGC(オートゲインコントロール)ON/OFFスイッチ**

**ON**:オートゲインコントロール(工場出荷時の設定)

**OFF**:0dB

**❹出力信号(Y/C/VBS)切り換えスイッチ**

カメラ出力信号を選択します。

**Y/C**:Y(輝度信号)/C(色信号)分離信号を出力するときは、この位置にします。

**VBS**:VBS信号を出力するときは、この位置にします。(工場出荷時の設定)

**2 R調整ボリューム**

WHITE BALANCE調整用DIPスイッチがMANに設定されているとき動作します。赤色系調整ボリュームです。付属の調整用ドライバーで調整してください。

**3 B調整ボリューム**

WHITE BALANCE調整用DIPスイッチがMANに設定されているとき動作します。青色系調整ボリュームです。付属の調整用ドライバーで調整してください。

**4 DC IN/SYNC/VIDEO端子(12ピン)**

カメラケーブルCCXC-12P05S/D/R/U/Lを接続し、DC+12Vの電源の供給を受けるとともにカメラモジュールからの映像信号を出力します。また、同期信号発生器を接続して外部同期信号(VS、HD/VD)を入力すると、カラーカメラモジュールを外部同期で動作させることができます。

**5 レンズ端子(3ピン)**

オートアイリスレンズ用端子です。

**6 レンズマウント(専用マウント)**

使用できるレンズは次の通りです。

専用レンズ(別売り)

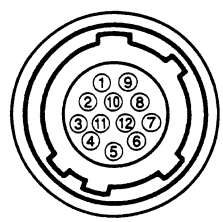
・スペシャルMTレンズVCL-12S12XM (f=12mm)

・スペシャルMTレンズVCL-06S12XM (f=6mm)

Cマウント式レンズ(別売り)

ただし、CマウントアダプターLO-999CMTが必要です。

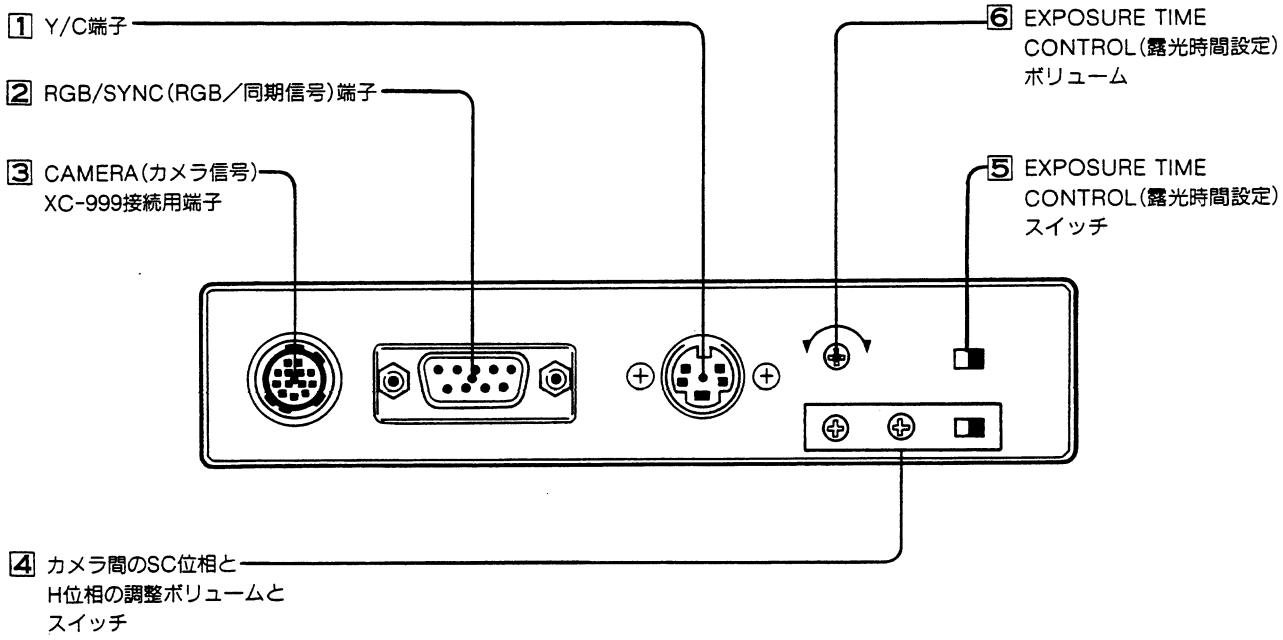
**DC IN/SYNC/VIDEO端子のピン配置**




| ピン番号＼信号 | 同期信号の種類 | | |
|---|---|---|---|
| | 外部同期信号 | | 内部同期信号 |
| | **HD、VD** | **VS** | |
| 1 | GND(アース) | GND(アース) | GND(アース) |
| 2 | +12V | +12V | +12V |
| 3 | VBS/Y出力(アース) | VBS/Y出力(アース) | VBS/Y出力(アース) |
| 4 | VBS/Y出力(信号) | VBS/Y出力(信号) | VBS/Y出力(信号) |
| 5 | HD入力(アース) | —— | —— |
| 6 | HD入力(信号) | —— | —— |
| 7 | VD入力(信号) | VS入力(信号) | —— |
| 8 | −/C出力(アース) | −/C出力(アース) | −/C出力(アース) |
| 9 | −/C出力(信号) | −/C出力(信号) | −/C出力(信号) |
| 10 | GND(アース) | GND(アース) | GND(アース) |
| 11 | +12V | +12V | +12V |
| 12 | VD入力(アース) | VS入力(アース) | —— |

## RGBアダプターCMA-999

**前面**

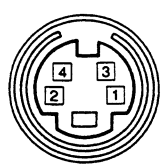



### 1 Y(輝度信号)/C(色信号)端子

Y/C分離信号を出力します。

接続にはケーブルYC-15EVを使用してください。

**Y/C端子のピン配列**

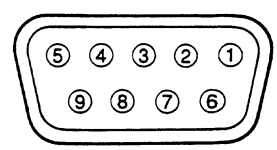



| ピン番号 | 出力信号 |
|---|---|
| 1 | GND(アース) |
| 2 | GND(アース) |
| 3 | Y出力 |
| 4 | C出力 |

### 2 RGB/SYNC(RGB/同期信号)端子(9ピン)

RGB 信号を出力します。接続には専用ケーブル CCXC-9DB、CCXC-9DDを使用してください。

**RGB/SYNC端子のピン配置**




| ピン番号 | 信号 |
|---|---|
| 1 | GND(アース) |
| 2 | GND(アース) |
| 3 | RED出力 |
| 4 | GREEN出力 |
| 5 | BLUE出力 |
| 6 | VBS(Y)出力 |
| 7 | SYNC(HD)出力 |
| 8 | NC(HD入力) |
| 9 | NC(VD入出力、C出力) |

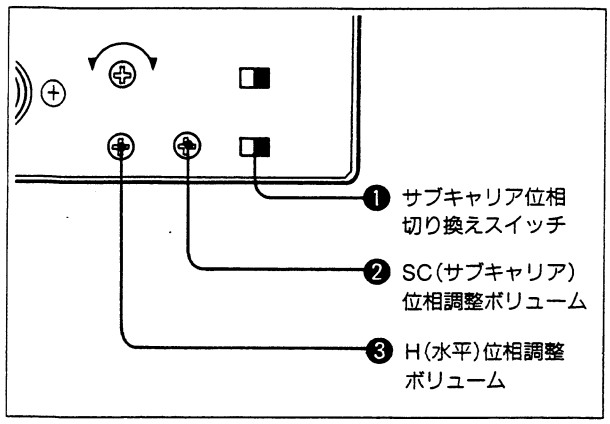
( )内の入出力信号設定については、2-6(J)ページをご覧ください。

### 3 CAMERA(カメラ)接続用端子(12ピン)

カラーカメラモジュールXC-999接続用端子です。

### 4 カメラ間のH位相とSC位相の調整スイッチとボリューム

2台以上カメラをつないだ場合の各カメラ間の画調(色調)を合わせるために、ゲンロック入力信号に対するカメラ出力信号のSC位相差とH位相差を調整するスイッチとボリュームです。




### 5 EXPOSURE TIME CONTROL(露光時間)設定スイッチ

**CCD IRIS**：露光時間をカメラが自動的に調整します。

**MAN**：RGBアダプターの露光時間調整ボリュームで調整するときに、この位置にします。

上記どちらの位置に設定してもカラービデオカメラモジュールXC-999のSHUTTERスピード設定用スイッチをCCD IRISに設定します。

### 6 露光時間調整ボリューム

EXPOSURE TIME CONTROL設定スイッチがMANのとき動作します。露光時間を調整することにより、シャッタースピードの時間を調整できます。

#### ❶サブキャリア位相切り換えスイッチ

同期信号とビデオ出力信号のSC(サブキャリア)位相差を0°または180°に切り換えます。

#### ❷SC(サブキャリア)位相調整ボリューム

サブキャリア位相スイッチでSC位相差を粗調整した後、このボリュームで微調整します。

#### ❸H(水平)位相調整ボリューム

外部同期信号とビデオ出力信号のH(水平)位相差を調整します。

調整は次のようにします。

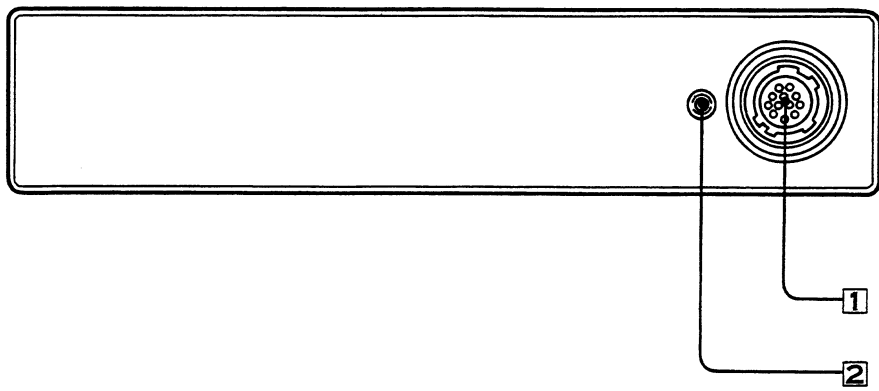
**SC位相合わせ**

まずサブキャリア位相スイッチで粗調整を行います。ゲンロック信号とビデオ出力信号の位相差を0°または180°に切り換えます。次にベクトルスコープを見ながらSC位相調整ボリュームで微調整を行います。

**H位相合わせ**

H位相調整ボリュームで調整します。波形モニターやオシロスコープを見ながら調整します。

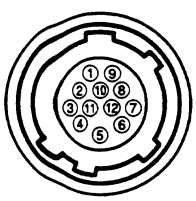
裏面




**1 DC IN/SYNC/VIDEO端子(12ピン)**

RGBアダプターをカメラダプターDC-77RRに組み込んで使用する場合は、この端子をカメラダプターに接続します。

**DC IN/SYNC/VIDEO端子のピン配置**




| ピン番号＼信号 | 同期信号の種類 | | |
|---|---|---|---|
| | 外部同期信号 | | 内部同期信号 |
| | **HD、VD** | **VBS/VS** | |
| 1 | GND(アース) | GND(アース) | GND(アース) |
| 2 | +12V | +12V | +12V |
| 3 | VBS出力(アース) | VBS出力(アース) | VBS出力(アース) |
| 4 | VBS出力(信号) | VBS出力(信号) | VBS出力(信号) |
| 5 | HD入力(アース) | — | — |
| 6 | HD入力(信号) | — | — |
| 7 | VD入力(信号) | VBS/VS入力(信号) | — |
| 8 | — | — | — |
| 9 | — | — | — |
| 10 | GND(アース) | GND(アース) | GND(アース) |
| 11 | +12V | +12V | +12V |
| 12 | VD入力(アース) | VBS/VS入力(アース) | — |

**2 75Ω終端ON/OFFスイッチ**

**ON**：

外部同期入力端子が(ピン番号6、7番)75Ω で終端されます。ジャンクションボックス JB-77 を使用する場合は、ON の位置にします。

**OFF**：

(工場出荷時の設定)

カメラアダプターDC-77RR に組み込んで使用する場合、このスイッチをOFFの位置にし、DC-77RR側で終端してください。

## 1-4. 設置

### 適応レンズ

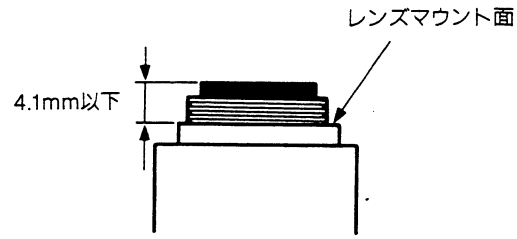
使用できるレンズは次のとおりです。

**専用レンズ(別売り)**

・スペシャルMTレンズ VCL-12S12XM (f=12mm)
・スペシャルMTレンズ VCL-06S12XM (f=6mm)

**Cマウント式レンズ**

1/2インチ用Cマウントレンズ(ただしレンズマウント面からの飛び出し量が、4.1mm以下のもの)。Cマウント式レンズを取り付ける場合は、CマウントアダプターLO-999CMTが必要です。



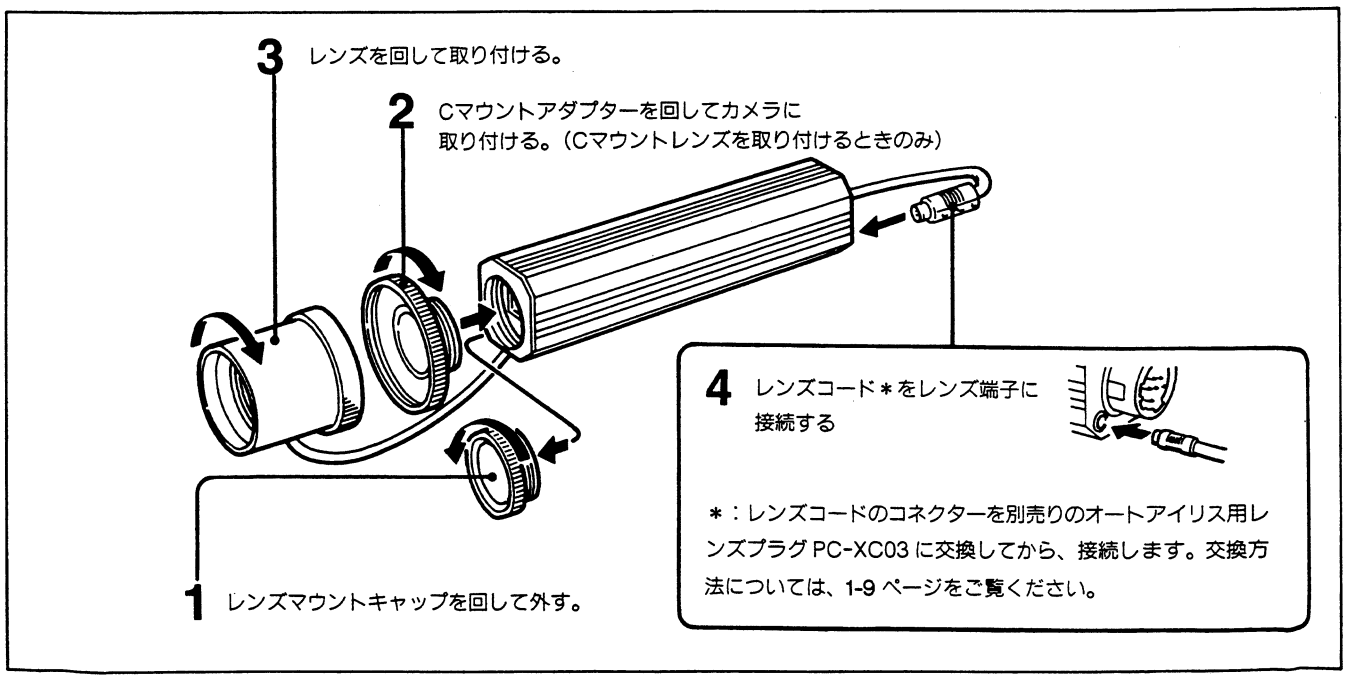

ご注意

2/3インチ用Cマウントレンズをご使用になると、画角が変わります。

### レンズの取り付け方法

レンズの取り付けおよび使用時のご注意

・超小型ですので取扱いは丁寧にしてください。
・レンズ端子に接続したレンズコードに無理な力を加えないでください。コードを抜くときは、必ずプラグをもって抜いてください。無理な力を加えると、プラグおよびカメラ内蔵のソケットが破損する場合があります。



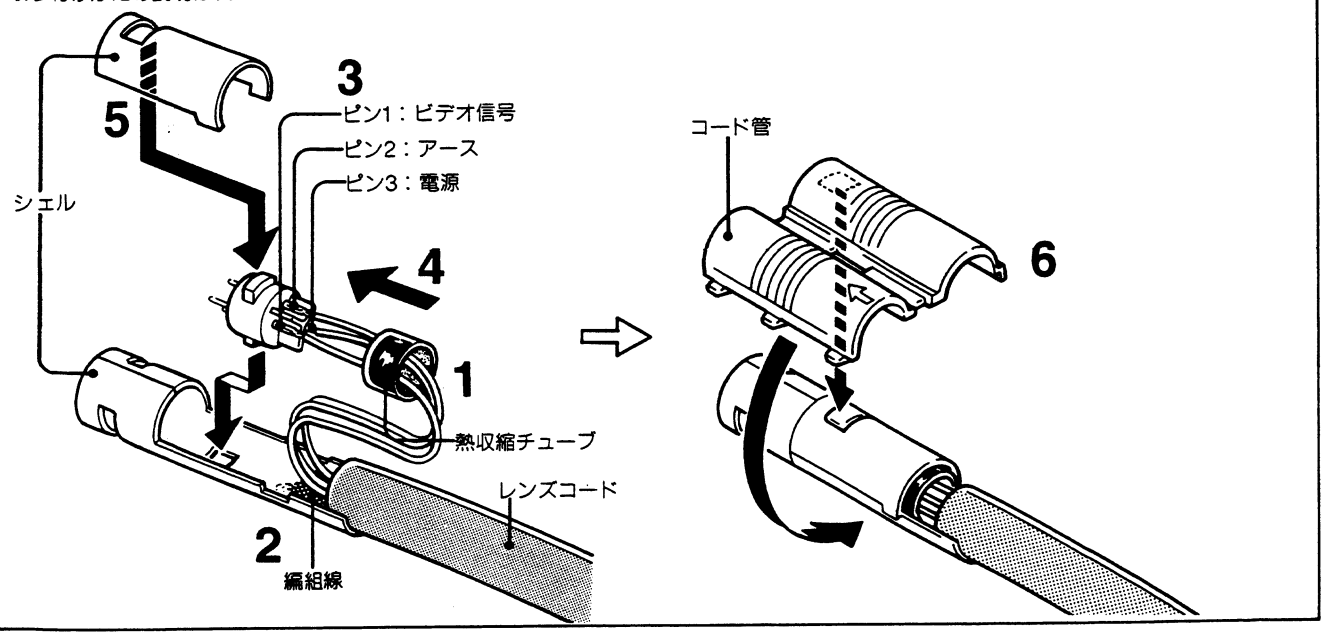
### 別売りのオートアイリス用レンズプラグの取り付けかた

オートアイリスレンズを本機に接続する場合は、下図のようにレンズコネクターを別売りのPC-XC03に交換してください。

ご注意

・超小型部品ですので取り付けおよび使用時は丁寧に扱ってください。
・オートアイリス用線材をプラグのピンに半田付けをするとき、280°C以下の温度の半田ごてで3秒以内で半田付けしてください。

取り付けかたの説明は次ページに記載しています。




**1** レンズコードからコネクターをはずします。線材に熱収縮チューブを通します。レンズコードの各線材の配線や使用しない線材の処理のしかたについては、レンズの取扱説明書をご覧ください。）

**2** レンズコードの編組線をシェル(金属)の底面部、図に示す位置に半田付けします。

**3** レンズコードの各線材を各ピンに半田付けします。

ご注意

線材をプラグの各ピンに半田付けするとき、280°C以下の半田ごてで3秒以内で半田付けしてください。

**4** 熱収縮チューブをプラグの端まで持ち上げ、チューブ周囲に半田ごてまたはドライヤーの熱風を当てます。チューブは縮みしっかりと固定されます。

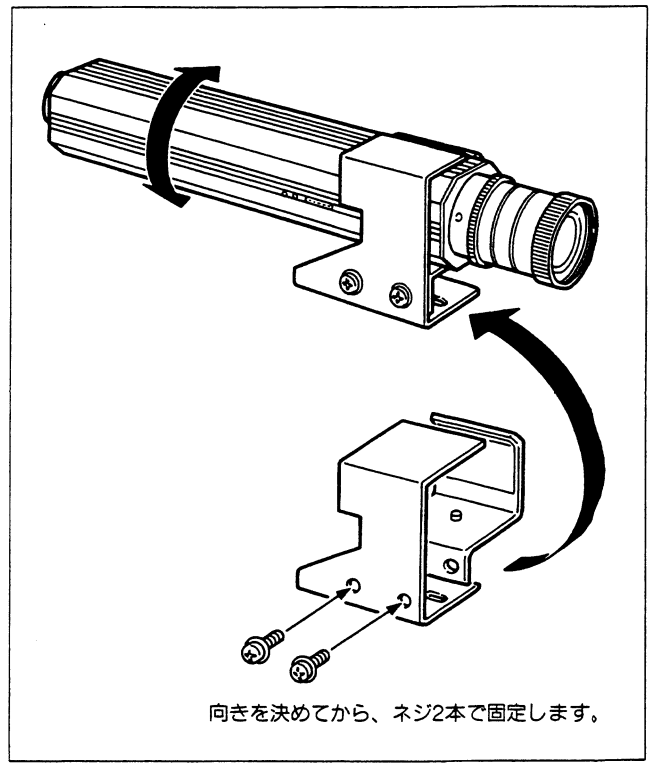
**5** プラグ本体をシェルに取り付けてから、もう一方のシェルを取り付けます。

**6** シェルの上からコード管(プラスチック)を取り付けてから、ひんじ部を境にしてコード管を閉じます。

## カメラの設置

### 三脚に取り付けて使うには

三脚に取り付けて使用する場合は、付属の三脚用アダプター２点を、図のように組み立てカメラ本体に取り付けてください。取り付ける際、カメラの向きを上下左右の4方向に調節することができます。



向きを決めてから、ネジ2本で固定します。

## 1-5. 接続

次の3つの接続例について説明します。

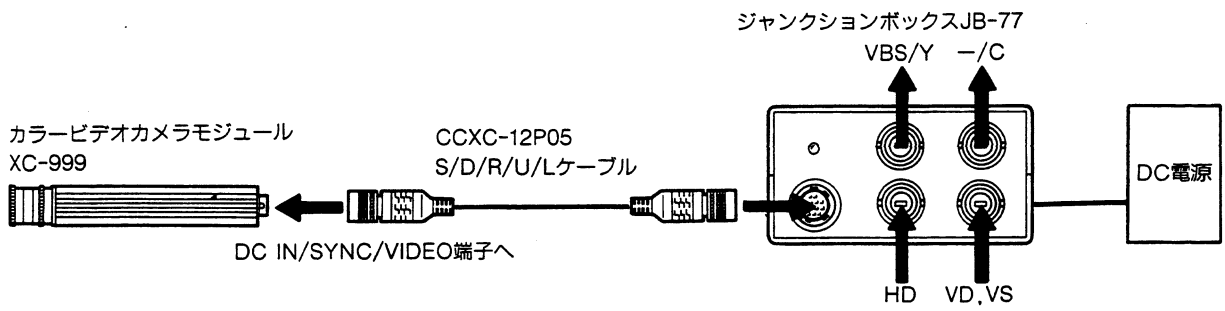
- カラービデオカメラモジュール単品で使用する場合
- 別売りのRGBアダプターCMA-999と組合せる場合
- カメラアダプターDC-77RRと組み合わせる場合

ご注意

- 接続する機器の電源を切ってください。電源を入れたまま接続すると内部の部品が破損するおそれがあります。
- コネクターを抜くときは、必ずプラグ部分を持って抜いてください。ケーブルを引っ張ると断線などの原因になります。

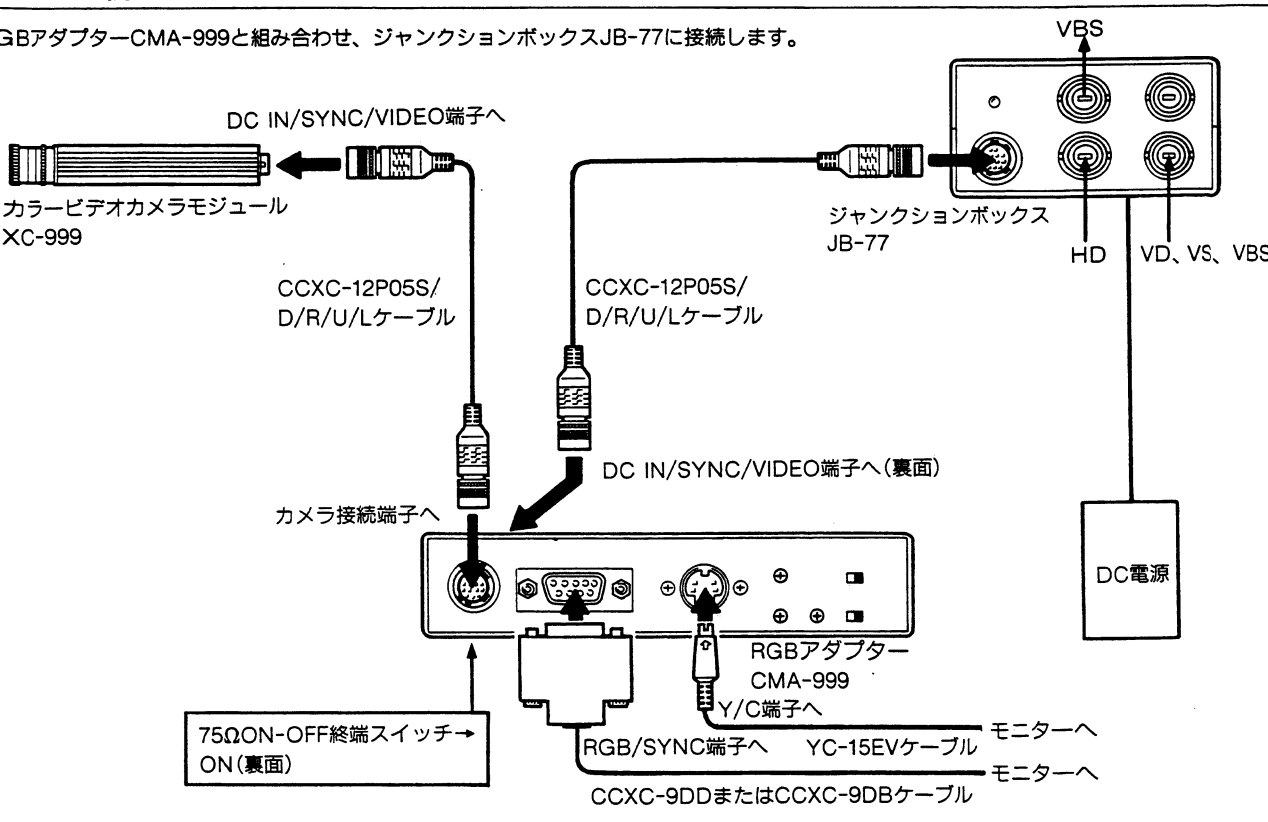
### システム 例1：カラービデオカメラモジュール単品で使用する場合

カラービデオカメラモジュールを直接ジャンクションボックスJB-77に接続します。




### システム 例2：RGBアダプターCMA-999と組み合わせる場合

RGBアダプターCMA-999と組み合わせ、ジャンクションボックスJB-77に接続します。



## システム 例3：カメラアダプターDC-77RRと組み合わせる場合

RGBアダプターCMA-999をカメラアダプターDC-77RRに組み込んでから、カラービデオカメラモジュールと接続します。接続については、カメラアダプターDC-77RRの取扱説明書をご覧ください。

**準備**

まず、RGBアダプターCMA-999をカメラアダプターDC-77RRに組み込みます。

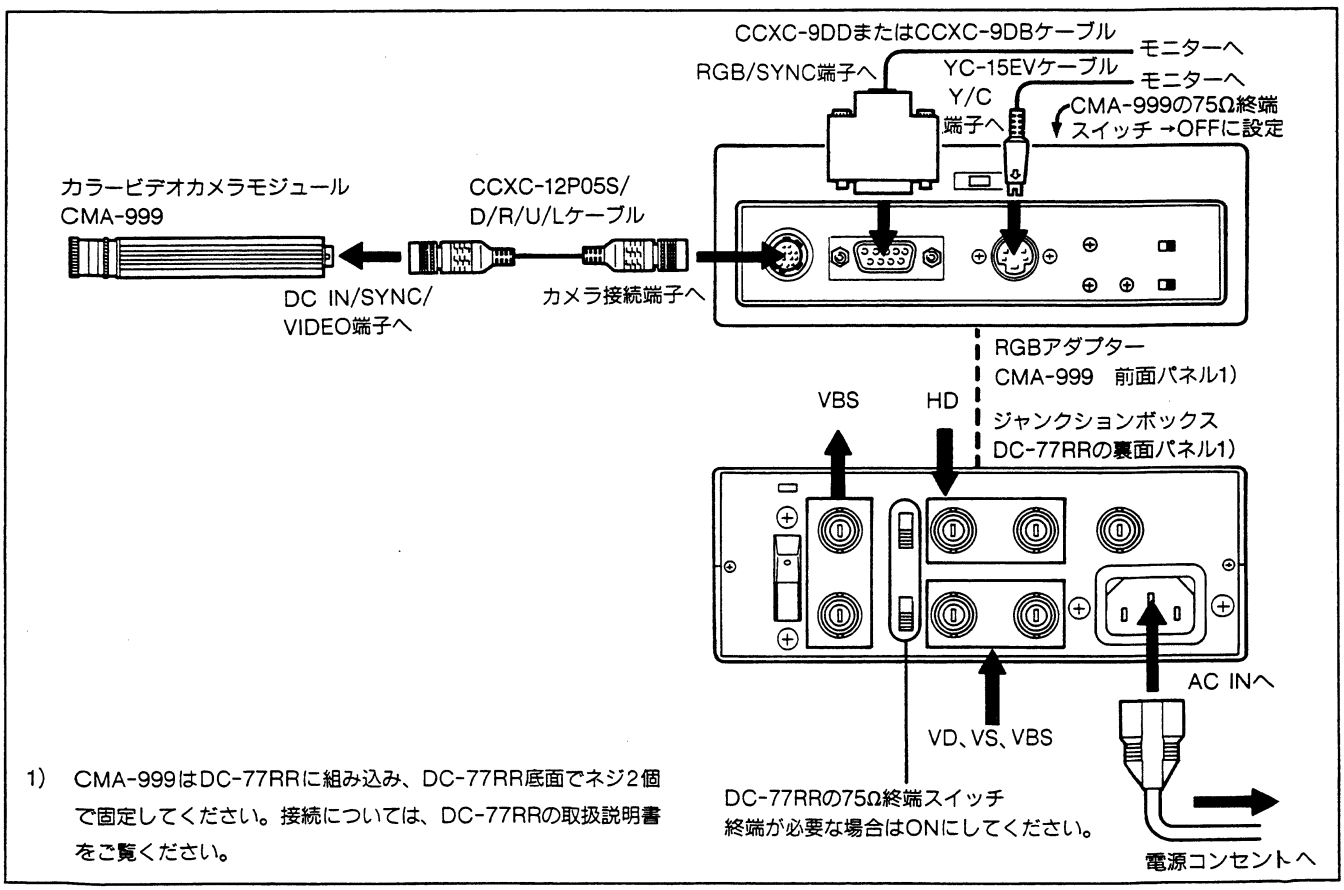
このときCMA-999を、カメラアダプターの底面からネジ2個で固定します。

**接続**

CMA-999の裏面の75ΩON/OFF終端スイッチをOFFにしてください。

ご注意

- RGBアダプターCMA-999の75ΩON/OFF終端スイッチをOFFに設定します。
- CMA-999のDC IN/SYNC/VIDEO端子とDC-77RRのカメラ接続端子とが接続されるように、しっかりと組み込んでください。




1) CMA-999はDC-77RRに組み込み、DC-77RR底面でネジ2個で固定してください。接続については、DC-77RRの取扱説明書をご覧ください。

### ゲンロックについて

本機は内部同期と外部同期が自動的に切り換わるようになっています。外部より下表に示す同期信号を入力すると、自動的に外部同期に切り換わります。

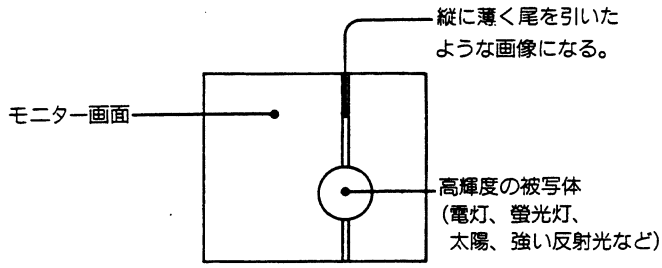
| 接続例 | 外部同期信号 | | |
|---|---|---|---|
| | HD/VD | VS | VBS |
| カメラ—JB-77の接続の場合 | ゲンロック可 | | ＊1 |
| カメラ—CMA-999—JB-77の接続の場合 | ゲンロック可 | | |
| カメラ—CMA-999—DC-77RRの接続の場合 | ゲンロック可 | | |

＊1：水平同期と垂直同期はかかりますが、色信号の位相を調整することは出来ません。

## 1-6. CCD特有の現象

CCDカメラを使用した場合、次のような現象が現れることがありますが、故障ではありません。

**スミア現象**：高輝度の被写体を写した場合に起こる現象




**梨地状の模様**：高音時に動作せたとき、一定のパターンをもつ模様(ノイズ)が、モニター全体に渡って現れること

**折返しひずみ**：縞模様、線などを写したとき、ぎざぎざに見える現象

## 1-7. 主な仕様

**撮像部**

| | |
|---|---|
| 撮像素子 | 1/2インチ インターライン転送方式CCD |
| 色フィルター | 補色モザイクフィルター |
| 有効画素数 | 768×494(水平／垂直)約38万画素 |
| 撮像面積 | 6.4×4.8mm |

**光学系、その他**

| | |
|---|---|
| レンズマウント | 専用マウント |
| 信号方式 | EIAJ標準NTSCカラー方式 |
| 走査方式 | 走査線数525本、2：1インターレース　毎秒30枚 |
| 同期方式 | 内部／外部(自動切り替え) |
| 外部同期入力 | HD/VD、VS |
| 水平解像度 | 470TV本 |
| 最低被写体照度 | 4.5lux (F1.2, AGC：ON) |
| 感度 | 2000lux F5.6 AGC：OFF(0dB) |
| 映像出力 | VBS／Y/C(スイッチ切り換え)<br>VBS: 1 Vp-p、75Ω、同期負<br>Y: 1 Vp-p、75Ω<br>C：コンポジットビデオ出力に準ずる |
| 映像S/N | 48dB以上 AGC：OFF(0dB) |
| シャッタースピード | 4モード：1/60(OFF)、1/1000、CCD IRIS、フリッカーレス |
| ホワイトバランス | 4モード：ATW、3200K、5600K、MAN. |
| ゲインコントロール | 2モード：AGC、固定(0dB) |
| 出力端子 | DC IN/SYNC/VIDEO端子：12ピン<br>LENS：3ピン |
| 電源電圧 | DC10.5～15V |
| 消費電力 | 3.5W |
| 使用温度 | 0°～40°C |
| 保存温度 | −20°～60°C |
| 使用湿度 | 80%(結露状態は不可) |
| 保存湿度 | 90%(結露状態は不可) |
| 耐衝撃性 | 70G以内 |
| 外形寸法 | 22×22×120mm(幅／高さ／奥行き)<br>突起部含まず |
| 重量 | 約99g |
| 付属品 | レンズマウントキャップ(1)<br>三脚用アダプター(1対)<br>調整用ドライバー(1)<br>ラベル(1)<br>取扱説明書(1) |

# 別売アクセサリー

## カメラアダプター

RGBアダプターCMA-999

| | |
|---|---|
| 電源電圧 | DC10.5～15V |
| 消費電力 | 4.5W |
| 使用温度 | 0°～40°C |
| 保存温度 | −20°～60°C |
| 使用湿度 | 80%(結露状態は不可) |
| 保存湿度 | 90%(結露状態は不可) |
| 耐衝撃性 | 40G以内 |
| 外形寸法 | 135.5×30×69mm(幅／高さ／奥行き)<br>突起部含まず |
| 重量 | 約290g |

カメラアダプター

DC-77RR

ジャンクションボックス

JB-77

## レンズおよびレンズアクセサリー

スペシャルMT(マウント)レンズ

VCL-12S12XM (f=12mm)

VCL-06S12XM (f=6mm)

VCL-03S12XM (f=3.5mm)

VCL-7S12XEA (f＝7mm)

マウントアダプター

LO-999CMT

接写リングキット

LO-999ERK

オートアイリス用レンズプラグ

PC-XC03

## ケーブル

12ピンカメラケーブル

CCXC-12P05S/D/R/U/L

D-SUB9ピン−D-SUB9ピンケーブル

CCXC-9DD

D-SUB9ピン−BNC×5ケーブル

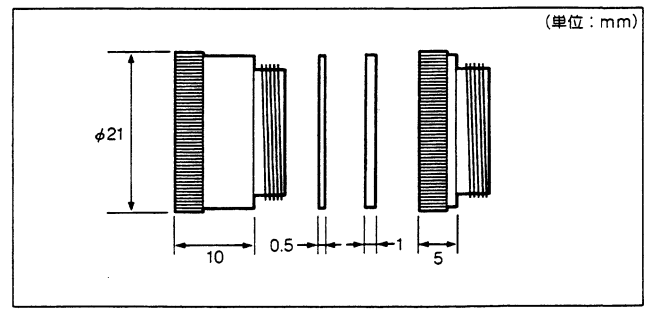
CCXC-9DB

DIN 4ピンコネクター付きケーブル

YC-15EV

## 接写リングキット

LO-999ERK




接写リング装着時の被写体の撮像可能範囲とピントの合う範囲

**表の見方**（単位：mm）

t＝接写リングの厚み

↑

0.5 FAR　158×118　290

NEAR　73×55　145

↓　↓　↓

Focus ポジション　撮像可能範囲　メカ先端からの被写体距離

(ピントの合う範囲)

| t | Focus | VCL-12S12XM (f=12mm) | VCL-06S12XM (f=6mm) |
|---|---|---|---|
| 0.5 | FAR<br>NEAR | 158×118　290<br>73×55　145 | 78×59　65<br>61×46　47 |
| 1 | FAR<br>NEAR | 79×59　139<br>52×39　98 | 39×29　27<br>34×25　22 |
| 1.5 | FAR<br>NEAR | 52×39　88<br>40×30　72 | 26×20　15<br>23×18　12 |
| 5 | FAR<br>NEAR | 16×12　18<br>16×12　18 | |
| 10 | FAR<br>NEAR | 8×6　2<br>8×6　1 | |

数値は、1/2インチカメラを使用したときのものです。

仕様および外観は、改良のため予告なく変更することがありますが、ご了承ください。

# 第2章
# 製品仕様

## 2-1. 仕様

### <カメラモジュール XC-999>

**撮像部**

| | |
|---|---|
| 撮像素子 | 1/2インチ インターライン転送方式CCD |
| 色フィルター | 補色モザイクフィルター |
| 有効画素数 | 768×494(水平／垂直)約38万画素 |
| 撮像面積 | 6.4×4.8mm |

**光学系、その他**

| | |
|---|---|
| レンズマウント | 専用マウント |
| 信号方式 | EIAJ標準NTSCカラー方式 |
| 走査方式 | 走査線数525本、2：1インターレース　毎秒30枚 |
| 同期方式 | 内部／外部(自動切り替え) |
| 外部同期入力 | HD/VD (2~4 V p-p)、75Ω終端 |
| | VS (1.0 V p-p)、75Ω終端 |
| | S (SYNC、 2~4 V p-p)、75Ω終端 |
| 外部同期周波数偏差 | |
| | VD：59.94 ± 0.0009 Hz |
| | HD：15734.264 ± 0.016 Hz |
| 水平解像度 | 470TV本 |
| 最低被写体照度 | 4.5lux (F1.2, AGC：ON) |
| 感度 | 2000lux F5.6 AGC：OFF(0dB) |
| 映像出力 | VBS／Y/C(スイッチ切り換え) |
| | VBS: 1 Vp-p、75Ω、同期負 |
| | Y: 1 Vp-p、75Ω |
| | C：コンポジットビデオ出力に準ずる |
| 映像S/N | 48dB以上 AGC：OFF(0dB) |
| シャッタースピード | |
| | 4モード：1/60(OFF)、1/1000、CCD IRIS、フリッカーレス |
| ホワイトバランス | |
| | 4モード：ATW、3200K、5600K、MAN. |
| ゲインコントロール | |
| | 2モード：AGC、固定(0dB) |
| 出力端子 | DC IN/SYNC/VIDEO端子：12ピン |
| | LENS：3ピン |
| 電源電圧 | DC10.5~15V |
| 消費電力 | 3.5W |
| 使用温度 | 0°~40°C |
| 保存温度 | −20°~60°C |
| 使用湿度 | 80%(結露状態は不可) |
| 保存湿度 | 90%(結露状態は不可) |
| 耐衝撃性 | 70G以内 |
| 外形寸法 | 22×22×120mm(幅／高さ／奥行き) |
| | 突起部含まず |
| 重量 | 約99g |

### <RGBアダプター CMA-999>

| | |
|---|---|
| 外部同期入力 | VBS (1.0 V p-p)、75Ω終端 |
| | HD/VD (2~4 V p-p)、75Ω終端 |
| | VS (1.0 V p-p)、75Ω終端 |
| | S (SYNC、 2~4 V p-p)、75Ω終端 |
| 出力端子 | Y/C端子：4ピン |
| 入出力端子 | RGB/SYNC端子：9ピン |
| | CAMERA接続用端子：12ピン |
| | DC IN/SYNC/VIDEO端子：12ピン |
| 電源電圧 | DC10.5~15V |
| 消費電力 | 4.5W |
| 使用温度 | 0°~40°C |
| 保存温度 | −20°~60°C |
| 使用湿度 | 80%(結露状態は不可) |
| 保存湿度 | 90%(結露状態は不可) |
| 耐衝撃性 | 40G以内 |
| 外形寸法 | 135.5×30×69mm(幅／高さ／奥行き) |
| | 突起部含まず |
| 重量 | 約290g |

### <スペシャルマウントレンズ VCL-03S12XM>

焦点距離　f=3.5mm

### <スペシャルマウントレンズ VCL-06S12XM>

焦点距離　f=6mm

### <スペシャルマウントレンズ VCL-12S12XM>

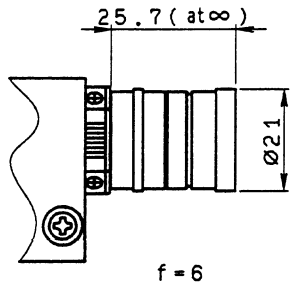
焦点距離　f=12mm

### <スペシャルマウントレンズ VCL-7S12XEA>

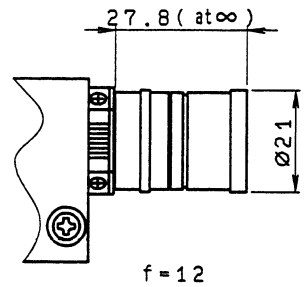
焦点距離　f=7mm

寸法

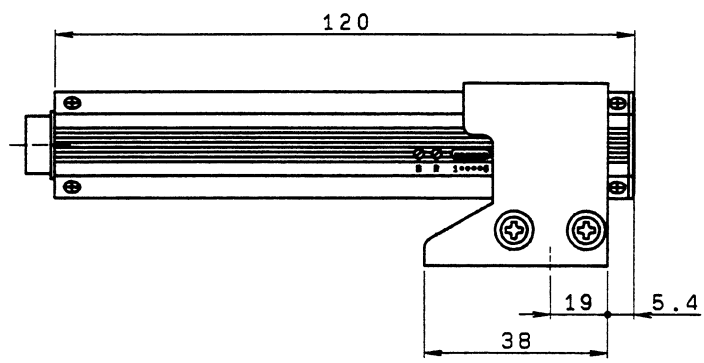
カメラモジュール＜XC-999＞

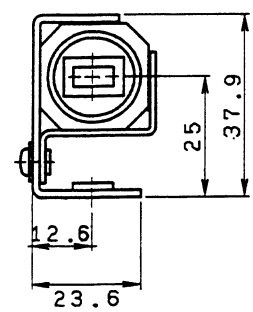



f=6

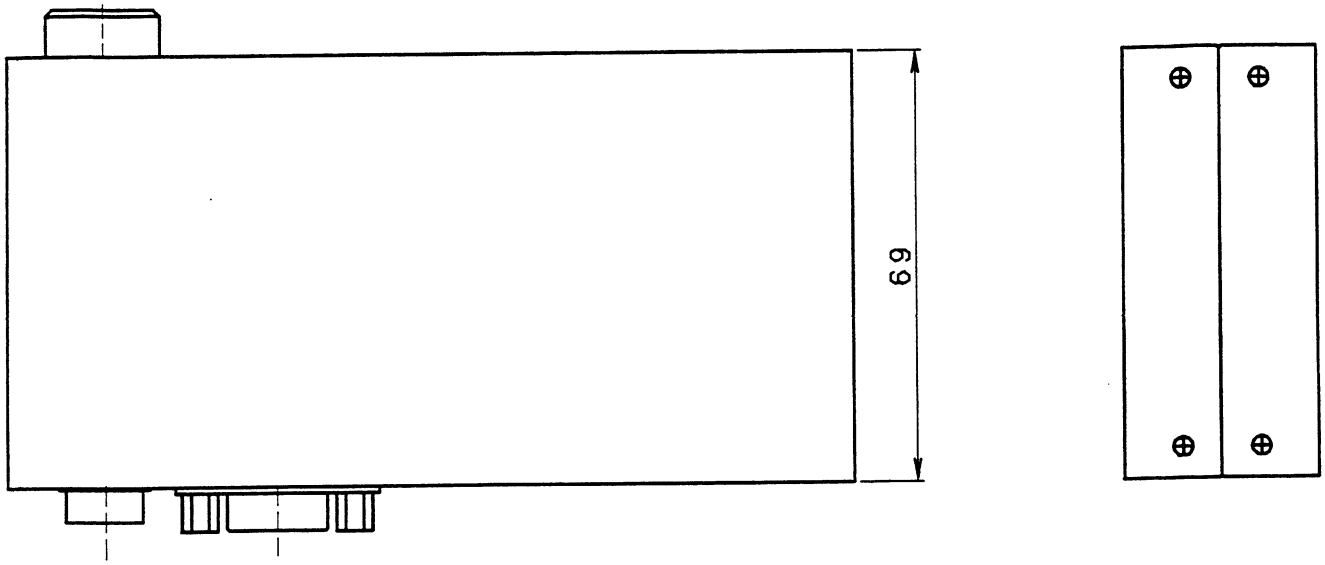


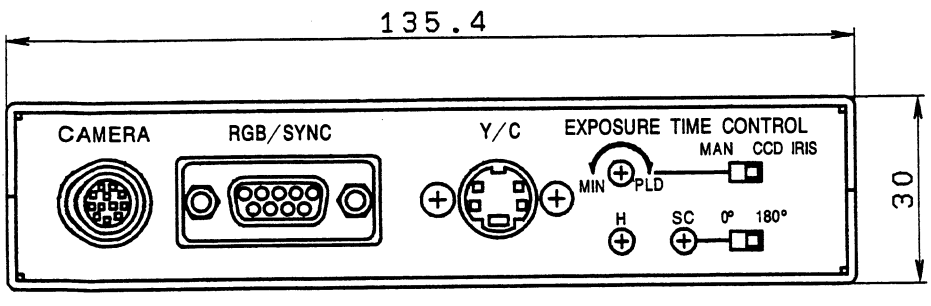

f=12



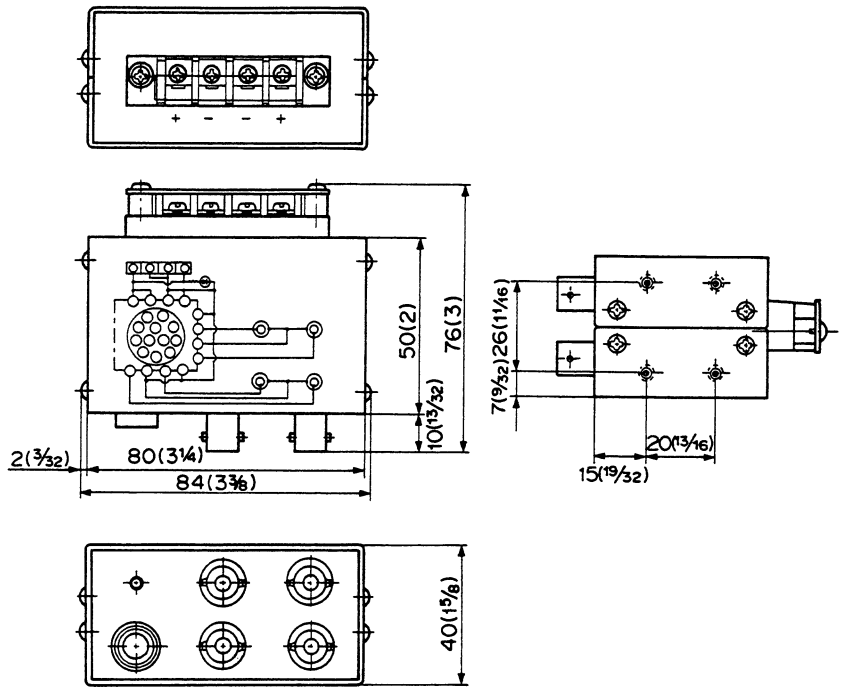



RGBアダプター＜CMA-999＞

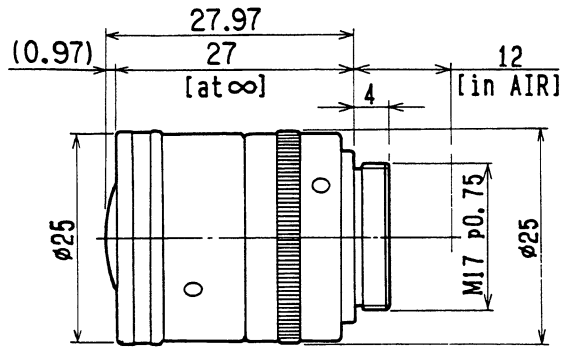


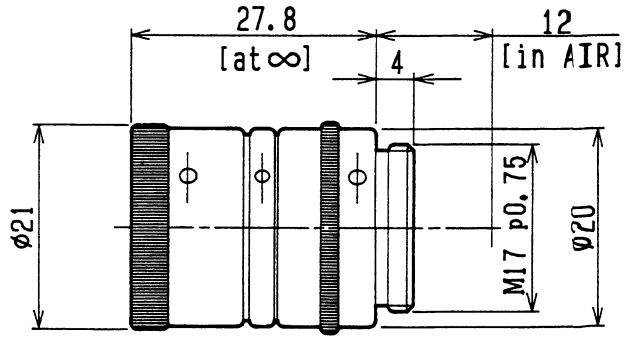
ジャンクションボックス＜JB-77＞



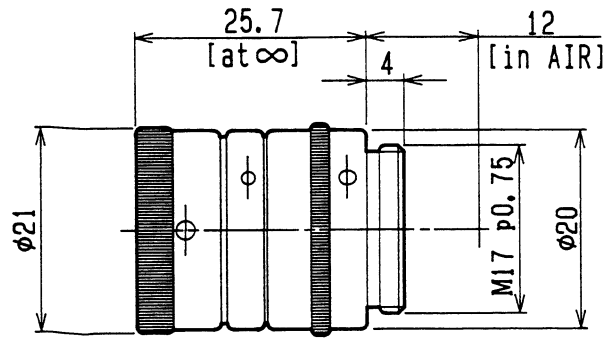

レンズ＜VCL-03S12XM＞



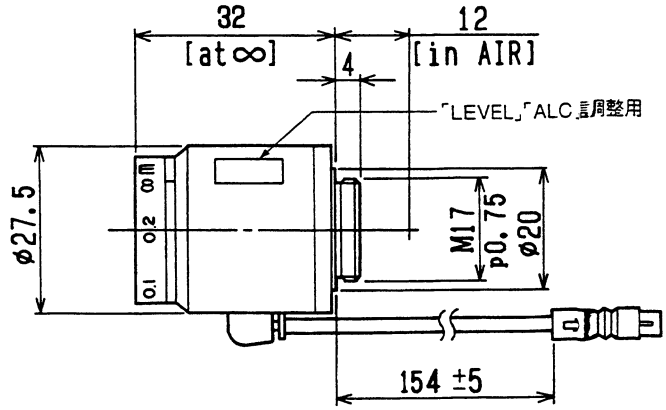

レンズ＜VCL-12S12XM＞




レンズ＜VCL-06S12XM＞




レンズ＜VCL-7S12XEA＞



## 2-2. 外部同期について

外部同期モードは，XC-999単体使用時のモードと，XC-999とCMA-999を組み合わせて使用する時のモードに大別されます。

(周波数偏差については,「2-1. 仕様」を参照して下さい。レベルについては,「2-4-1. コネクターの入出力信号」を参照して下さい。)

XC-999単体使用時
- S／VSモード
- HD，VDモード

XC-999とCMA-999を組み合わせて使用する時
- S／VS／VBSモード
- HD,VDモード

① S／VSモード

正規のコンポジット信号（S,VS）を12ピンコネクターの7番ピンに加えることで,外部同期を掛けるモードです。

② S／VS／VBSモード

正規のコンポジット信号（S,VSまたはVBS）を12ピンコネクターの7番ピンに加えることで,外部同期を掛けるモードです。

② HD，VDモード

正規のHD,VD信号を12ピンコネクターの6番ピンと7番ピンにそれぞれ加えることで外部同期を掛けるモードです。

## 2-3. 動作モードの設定

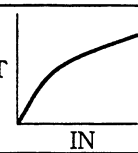
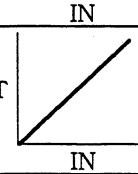
XC-999およびCMA-999は，用途に応じて動作モードを切り換えることが可能です。
そのモード設定は，チップ抵抗のマウントON／OFFを切り換えることによって行います。

・各動作モードの説明

1. XC-999

・ガンマ補正モード（γ ON／OFF）

VIDEO出力信号のガンマ補正を設定します。ガンマ補正をONに設定すると，ガンマ補正が行われたVIDEO映像信号を出力します。
ガンマ補正をOFFに設定すると，ガンマ補正を行いません。よって，被写体の光量に比例したVIDEO映像信号を得ることが出来ます。
設定は，PR-153基板のジャンパースイッチ（JR301，JR302）のON／OFFの組み合わせで行います。工場出荷時には,ガンマ補正モードをONに設定しています。

| MODE | 入出力特性 | ジャンパースイッチ |
|---|---|---|
| γ ON (0.45) |  | PR-153基板<br>JR301：M't<br>JR302：OPEN<br>（工場出荷時） |
| γ OFF (1.0) |  | PR-153基板<br>JR301：OPEN<br>JR302：M't |

2. CMA-999

・各基板の初期設定（工場出荷時の状態）
9ピンDサブコネクター出力は下記のようになります。

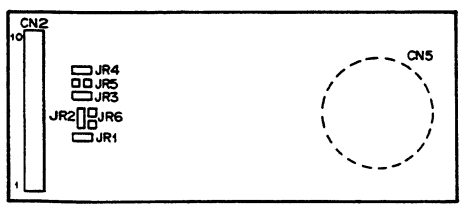
9ピンDサブコネクター出力

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | RED OUT |
| 4 | GREEN OUT |
| 5 | BLUE OUT |
| 6 | VBS OUT |
| 7 | SYNC OUT |
| 8 | ———— |
| 9 | ———— |

① CN-516基板

ジャンパースイッチ

| CN-516基板（A面） |
|---|
| JR1 : M't |
| JR2 : M't |
| JR3 : M't |
| JR5 : OPEN |
| JR6 : OPEN |

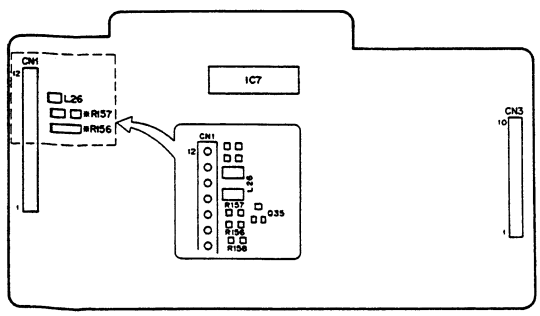



CN-516基板（A面）

② EN-98基板

ジャンパースイッチ

| EN-98基板（B面） |
|---|
| R156 : M't (1 KΩ) |
| R157 : OPEN |



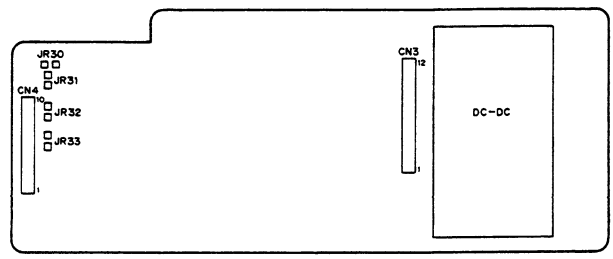

＊印のRef Noは基板上には印刷されておりません。

EN-98基板（B面）

③ SG-185基板

ジャンパースイッチ

| SG-185基板（A面） |
|---|
| JR30 : OPEN |
| JR31 : OPEN |
| JR32 : OPEN |
| JR33 : OPEN |

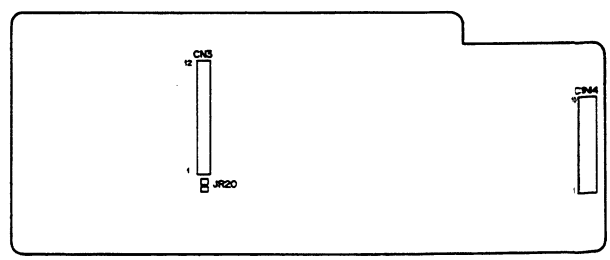



SG-185基板（A面）

④ SG-185基板

ジャンパースイッチ

| SG-185基板（B面） |
|---|
| JR20 : OPEN |




SG-185基板（B面）

・9ピンDサブコネクターからY/C信号を出力する方法

CN-516基板

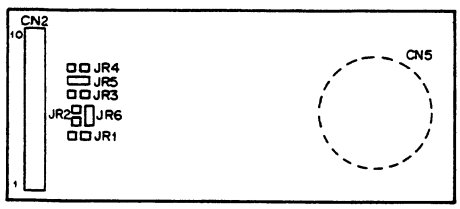
9ピンDサブコネクター出力

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | RED OUT |
| 4 | GREEN OUT |
| 5 | BLUE OUT |
| 6 | Y OUT |
| 7 | SYNC OUT |
| 8 | ——— |
| 9 | CHROMA OUT |

ジャンパースイッチ

| CN-516基板（A面） |
|---|
| JR1：OPEN<br>JR2：OPEN<br>JR3：OPEN<br>JR4：OPEN<br>JR5：M't<br>JR6：M't |

（この場合，Y／C端子には信号は出力されない）




CN-516基板（A面）

・9ピンDサブコネクターからHD／VD信号を出力する方法

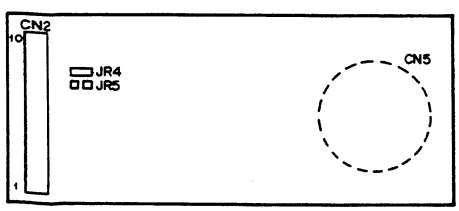
9ピンDサブコネクター出力

| | |
|---|---|
| 7 | HD OUT |
| 8 | ——— |
| 9 | VD OUT |

① CN-516基板

ジャンパースイッチ

| CN-516基板（A面） |
|---|
| JR4：M't<br>JR5：OPEN |

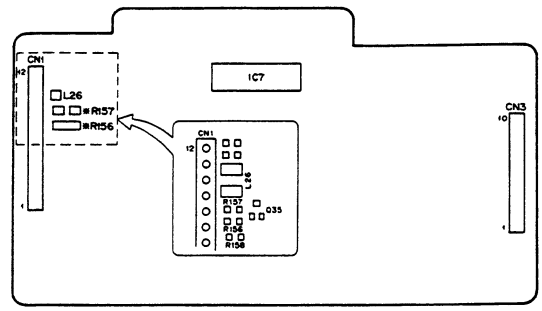



CN-516基板（A面）

② EN-98基板

ジャンパースイッチ

| EN-98基板（B面） |
|---|
| R156：OPEN<br>R157：1 kΩ M't |



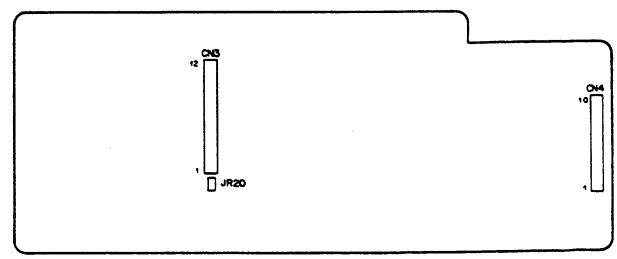

＊印のRef Noは基板上には印刷されておりません。

EN-98基板（B面）

③ SG-185基板

ジャンパースイッチ

| SG-185基板（B面） |
|---|
| JR20：M't |




SG-185基板（B面）

・9ピンDサブコネクターからHD／VD信号を入力する方法

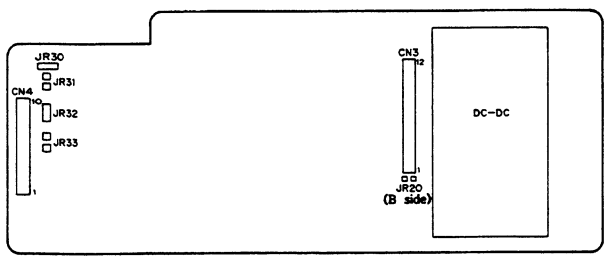
9ピンDサブコネクター出力

| | |
|---|---|
| 7 | SYNC OUT |
| 8 | HD IN |
| 9 | VD IN |

① SG-185基板

ジャンパースイッチ

| SG-185基板 |
|---|
| JR20 : OPEN (B面) |
| JR30 : M't (A面) |
| JR31 : OPEN (A面) |
| JR32 : M't (A面) |
| JR33 : OPEN (A面) |

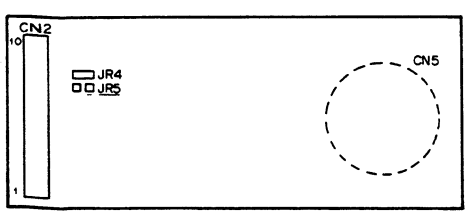



SG-185基板（A面）

② CN-516基板

ジャンパースイッチ

| CN-516基板（A面） |
|---|
| JR4 : M't |
| JR5 : OPEN |




CN-516基板（A面）

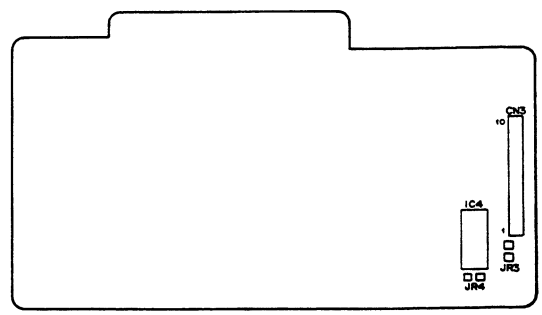
・4ピンGREEN OUTのSYNC付加ON／OFF

GREEN OUTのSYNC付加ON／OFFの設定は、EN-98基板上にマウントされたチップ抵抗、又は、S2のスイッチをON／OFF（下記）を切り換えることによって行います。用途に応じて切り換えて下さい。

9ピンDサブコネクター
4ピン出力（GREEN OUT）

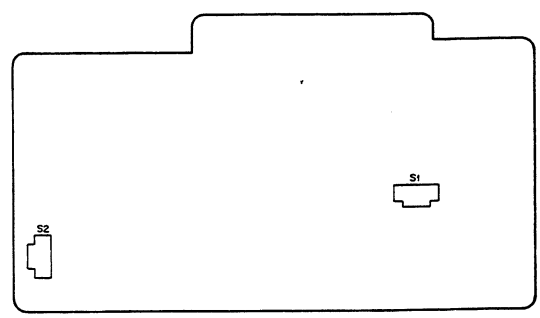
① ジャンパースイッチによる方法

| モード | EN-98基板（B面） |
|---|---|
| SYNC付加 | JR3 : OPEN<br>JR4 : M't<br>（ジャンパースイッチ） |
| SYNCなし | JR3 : M't<br>JR4 : OPEN<br>（ジャンパースイッチ） |




EN-98基板（B面）

② S2のスイッチによる方法




EN-98基板（A面）

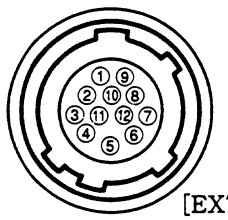
## 2-4. 適合コネクター/ケーブル

### 2-4-1. コネクターの入出力信号

本体に使用しているコネクターの入出力は下記のようになっています。

1. XC-999

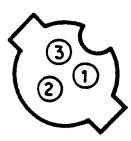
DC IN/SYNC/VIDEO (12P, MALE)




[EXT VIEW]

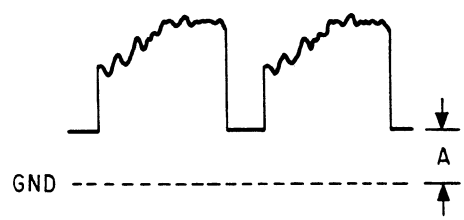
| | 同期信号の種類 | | | | | |
|---|---|---|---|---|---|---|
| | 外部同期信号 | | | | 内部同期信号 | |
| | HD, VD | | S, VS | | | |
| No | 信号名 | 規　格 | 信号名 | 規　格 | 信号名 | 規　格 |
| 1 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 2 | +12V IN | +12 Vdc | +12V IN | +12 Vdc | +12V IN | +12 Vdc |
| 3 | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y |
| 4 | VBS/Y OUT | 714mVp-p, 75Ω, 同期負 | VBS/Y OUT | 714mVp-p, 75Ω, 同期負 | VBS/Y OUT | 714mVp-p, 75Ω, 同期負 |
| 5 | GND(HD) | GND for HD | ——— | | ——— | |
| 6 | HD IN | 2 to 4 Vp-p, 75Ω | ——— | | ——— | |
| 7 | VD IN | 2 to 4 Vp-p, 75Ω | S/VS IN | 2 to 4 Vp-p, 75Ω | ——— | |
| 8 | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C |
| 9 | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT |
| 10 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 11 | +12V IN | +12 Vdc | +12V IN | +12 Vdc | +12V IN | +12 Vdc |
| 12 | GND(VD) | GND for VD | GND(S/VS) | GND for S/VS | ——— | |

LENS (3P, FEMALE)



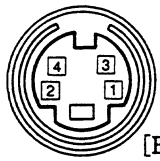

[EXT VIEW]

| No | 信号名 | 規　格 |
|---|---|---|
| 1 | IRIS OUT | A=1.7 to 2.0 Vdc |
| 2 | GND | |
| 3 | DC OUT | +12 Vdc |



## 2. CMA-999

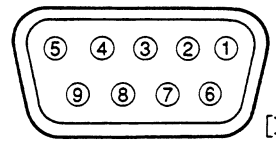
### Y/C (4P, FEMALE)




[EXT VIEW]

| No | 信号名 | 規　格 |
|---|---|---|
| 1 | GND | |
| 2 | GND | |
| 3 | Y OUT | 1 Vp-p, 75Ω |
| 4 | CHROMA OUT | レベルはコンポジット信号に準ずる |

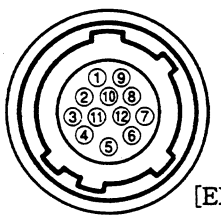
### RGB/SYNC (9P, FEMALE)




[EXT VIEW]

| No | 信号名 | 規　格 |
|---|---|---|
| 1 | GND | |
| 2 | GND | |
| 3 | RED OUT | 714mVp-p, 75Ω |
| 4 | GREEN OUT | 714mVp-p, 75Ω, G SYNC:OFF |
| 5 | BLUE OUT | 714mVp-p, 75Ω |
| 6 | VBS(Y) OUT | 1 Vp-p, 75Ω |
| 7 | SYNC(HD) OUT | 2 Vp-p, 75Ω |
| 8 | NC(HD IN) | 2 Vp-p, 75Ω |
| 9 | NC(VD I/O, C OUT) | VD: 286mVp-p, 75Ω |
| | | C: 286mVp-p, 75Ω |

### DC IN/SYNC/VIDEO (12P, MALE)




[EXT VIEW]

| | 同期信号の種類 | | | | | |
|---|---|---|---|---|---|---|
| | 外部同期信号 | | | | 内部同期信号 | |
| | HD, VD | | S, VS | | | |
| No | 信号名 | 規　格 | 信号名 | 規　格 | 信号名 | 規　格 |
| 1 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 2 | +12V | +12 Vdc | +12V | +12 Vdc | +12V | +12 Vdc |
| 3 | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y | GND(VBS/Y) | GND for VBS/Y |
| 4 | VBS/Y OUT | 714mVp-p, 75Ω, 同期負 | VBS/Y OUT | 714mVp-p, 75Ω, 同期負 | VBS/Y OUT | 714mVp-p, 75Ω, 同期負 |
| 5 | GND(HD) | GND for HD | ——— | | ——— | |
| 6 | HD IN | 2 to 4 Vp-p, 75Ω | ——— | | ——— | |
| 7 | VD IN | 2 to 4 Vp-p, 75Ω | S/VS IN | 2 to 4 Vp-p, 75Ω | ——— | |
| 8 | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C | GND(-/C) | GND for -/C |
| 9 | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT | -/C OUT | COMPOSITE OUT |
| 10 | GND | GND for +12V | GND | GND for +12V | GND | GND for +12V |
| 11 | +12V | +12 Vdc | +12V | +12 Vdc | +12V | +12 Vdc |
| 12 | GND(VD) | GND for VD | GND(S/VS) | GND for S/VS | ——— | |

## 2-4-2. 接続コネクター

設置時やサービス時などにおいてコネクターパネル部の各種コネクターにケーブルを接続する際には、その先端に次に記すコネクターまたは同等品を使用してください。

XC-999

| コネクターの機能名称 | 接続するケーブル側のコネクターの部品番号および名称 |
|---|---|
| DC IN/SYNC/VIDEO (12P, MALE) | 1-562-356-11 CONNECTOR, 12P, FEMALE (HIROSE HR10-10PA-12S or equivalent) |
| LENS (3P, FEMALE) | 1-691-290-11 PLUG, 3P, MALE (HIROSE SR38-4P-3P or equivalent) |

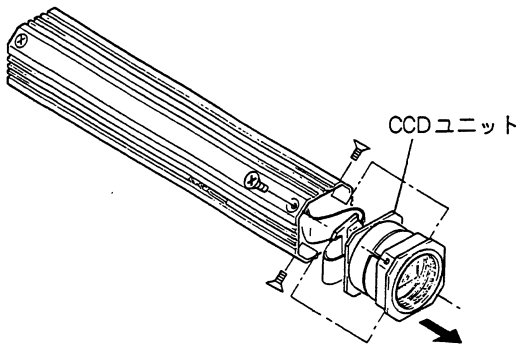
CMA-999

| コネクターの機能名称 | 接続するケーブル側のコネクターの部品番号および名称 |
|---|---|
| Y/C (4P, FEMALE) | SONY cable "YC-15EV" or Super-VHS Cable HOSIDEN "TPX3630" or equivalent |
| RGB/SYNC (D-SUB 9P, FEMALE) | 1-566-354-11 D-SUB, 9P, MALE |
| CAMERA (12P, FEMALE) | 1-566-369-21 CONNECTOR, 12P, MALE (HIROSE HR10A-10P-12PC or equivalent) |
| DC IN/SYNC/VIDEO (12P, MALE) | 1-562-356-11 CONNECTOR, 12P, FEMALE (HIROSE HR10-10PA-12S or equivalent) |

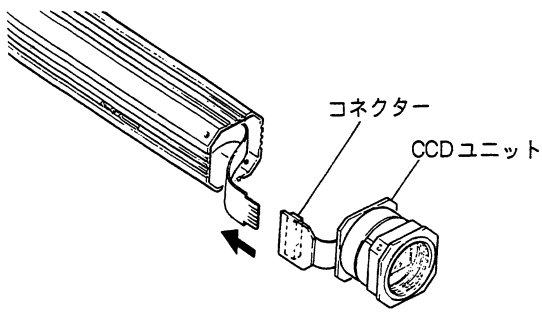
# 第3章
# サービスインフォメーション

## 3-1. CCDユニットの交換方法

1. 前面（ねじ4本）のねじを外します。
2. 矢印の方向にCCD UNIT を引き出します。




3. TG-89基板からCCD UNIT を切り離し新しいものと交換します。




4. 交換後、逆の手順で行って下さい。

# 第4章
# 回路概説

## 4-1. XC-999回路概説

### 4-1-1. CD-39基板

この基板にはIC1（CCDイメージャー）があり光を電気信号に変える。CCDチップ表面にはフォトセンサー（感光素子）が配置されている。フォトセンサーは水平方向に811個，垂直方向に508個，合計411,988個ある。このうち水平方向に768個，垂直方向に494個，合計379,392個が有効画素である。
入射光はフォトセンサー部で光の明暗に応じた電荷に変換される。変換された電荷はフォトセンサーから転送部に読み出され，その後順々に転送され出力部へ導かれる。
転送部には垂直転送部と水平転送部がある。
垂直転送部は図1に示すように画面の垂直方向に811本ある。また，水平転送部は画面（図1の最上部）の水平方向に1本ある。
フォトセンサーで変換された電荷は1フィールド毎に各フォトセンサーに隣接した垂直転送部に移される。各垂直転送部に移された電荷は垂直転送クロックV1，V2，V3，V4で並列に垂直に転送され，順次水平転送部に移される。
水平転送部は水平転送クロックH1，H2（周波数910fH）で電荷を水平方向に転送し出力部に送る。

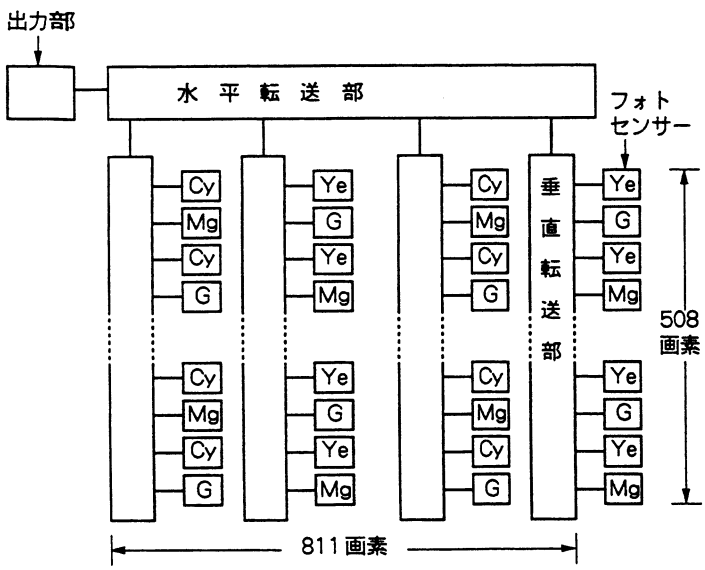


図1. CCDの内部構造

色フィルターのカラーコーディングは図2のようになっている。
フィールド読み出しを行うためAフィールドではA1，A2のようなペアで，Bフィールドでは Bのようなペアで電荷の混合が行われる。したがって，水平転送部より出てくる電荷の順番は，A1ラインを考えると（G＋Cy），（Mg＋Ye），（G＋Cy），（Mg＋Ye）が信号として出てくる。
この信号を処理してY信号とクロマ（色差）信号の近似信号を構成する。近似信号を構成するにはY信号は隣どうしを加算し，クロマ（色差）信号は減算することで得られる。

Y信号の近似信号：

$$Y = \{(G+Cy) + (Mg+Ye)\} \times \frac{1}{2} = \frac{1}{2}\{2B+3G+2R\}$$

クロマ（色差）信号の近似信号：

$$R-Y = \{(Mg+Ye) - (G+Cy)\} = \{2R-G\}$$

次に，A2ラインを考えると水平転送部からの信号は（Mg＋Cy），（G＋Ye），（Mg＋Cy），（G＋Ye）の順番で出力される。この信号によりY信号とクロマ（色差）信号はA1ラインと同一構成でバランスしている。

Y信号の近似信号：

$$Y = \{(G+Ye) + (Mg+Cy)\} \times \frac{1}{2} = \frac{1}{2}\{2B+3G+2R\}$$

クロマ（色差）信号の近似信号：

$$-(B-Y) = \{(G+Ye) - (Mg+Cy)\} = -\{2B-G\}$$

つまり，クロマ（色差）信号は線順次でR－Y，－（B－Y）が交互に取り出せる。Bフィールドも同様である。

IC1（CCDイメージャー）からの出力は出力部のコンデンサーで電荷を電圧信号に変換して出力されQ1のバッファを通った後にTG-89基板に出力される。

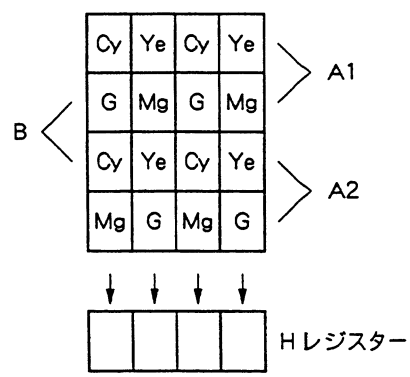


図2. カラーコーディング模式図

## 4-1-2. TG-89基板

この基板には下記の回路ブロックがある。

(1) サンプルホールド／AGC
IC2 (CXA1390AR)
(2) CCD駆動用タイミング信号発生器
IC3 (CXD1252AR)
(3) CCD垂直転送クロックドライバー
IC1 (CXD1250N)
(4) 同期信号発生／外部同期
IC5 (CXD1217M)
IC4 (CXD1216M)
(5) シャッターコントロール回路
(6) V SUB電圧供給
(7) IRIS／AGC検波回路
(8) 1820fH 発振回路

(1) サンプルホールド／AGC

CD-39基板のCCDイメージャーから出力される信号をDATA, PGの2本に分岐しそれぞれのタイミングにてサンプルホールドし信号分離を行う。

IC2に入力されたDATA, PG信号はどちらもサンプルホールドパルスXSHP, XSHDによりサンプルホールドされる。

このうちPGの方はXSHP, XSHD, XSHPの順に3回, DATAの方はXSHD, XSHPの順に2回サンプルホールドされる。このDATA, PGの差をとって信号分離が行われる。信号分離された信号はAGCアンプに入力されIC2外付けの検波回路にて検波され適正値に保たれる。

(2) CCD駆動用タイミング信号発生器

IC3は1820fH 発振回路出力と同期信号発生器出力のHD, VDパルスを入力することによりCCDを駆動するために必要なクロックやサンプルホールドパルス, クランプパルス等を発生する。

- CL : 910fH クロック。
- H1, H2 : CCDイメージャーHレジスター駆動パルス。
- XV1～XV4 XSG1, XSG2 : CCDイメージャーVレジスター駆動パルス。このパルスはIC1のドライブ回路を通ってCD-39基板に出力される。
- PG : プリチャージゲートパルス。
- CLP1～4 : 各種クランプパルス。
- XSHP, XSHD : 信号分離サンプルホールド用パルス。
- XSP1, XSP2 : 色分離サンプルホールド用パルス。
- XSH1, XSH2 : Y信号再合成サンプルホールド用パルス。
- XDL1, XDL2 : 色信号用CCD 1H DL駆動用パルス。
- XSUB : 電子シャッター用電荷掃き捨てパルス。

上記のようなパルスが出力される。

(3) CCD垂直転送クロックドライバー

CCDイメージャーVレジスター駆動パルスをドライブする。IC3から出力されたXV1～XV4とXSG1, XSG2, XSUBをドライブしCD-39基板に送る。

(4) 同期信号発生／外部同期

IC4, 5はCL（910fH）を入力することによりNTSCビデオ信号を作るのに必要な各種タイミング信号を発生する。

- SYNC　：コンポジットSYNC信号。
- BLK　：ブランキング信号。
- HD, VD　：水平, 垂直同期信号。
- FLD　：フィールド信号。
- BF　：バーストフラグ信号。
- INT／EXT　：同期モード切換え信号。
  INT(内部同期)モード：Low
  EXT(外部同期)モード：High
- H COMP OUT：1820fH発振回路のコントロール電圧出力。

(5) シャッターコントロール回路

CCDイメージャーのオーバーフロードレインDCバイアス（V SUB）に電荷掃き捨てパルスを重畳することにより電子蓄積時間を制御できる。
電荷掃き捨てパルスX SUBはIC1にて反転増幅されV SUB直流電圧に重畳されCCDイメージャー④PINに入力される。

(6) V SUB電圧供給回路

Q1を中心とした回路はCCDイメージャーのオーバーフロードレインに規定の電圧を供給するための回路である。Q1, Q2はV SUBコントロール電圧を基準電圧とするレギュレーターになっている。
V SUBコントロール電圧はRV1により約1.6V～5.0Vの範囲で可変でき, CCDイメージャーのオーバーフロードレイン電圧（④PIN：V SUB）が規定電圧となるように設定される。この電圧値はCCDイメージャーの裏面に略号で表示されている。

(7) IRIS／AGC検波回路

Q7を中心とした回路はCCD IRIS用検波回路である。またオートIRIS検波用出力はIC2⑰PINから映像信号（同期信号無し）としてCN-519基板に出力される。
Q5を中心とした回路はAGC検波回路である。IC2内部のオペアンプと共にAGCループを構成する。

(8) 1820fH発振回路

IC3①-②PIN間には1820fH発振用インバーターが内蔵されている。この端子に発振用水晶振動子, 負荷容量を接続しVCXOを構成している。この発振回路の周波数コントロール電圧はIC4⑨PIN（H COMP OUT）から出力される。

## 4-1-3. PR-153基板

(1) 信号処理系回路
IC301 (CXL1507N)
IC302 (CXA1391R)
IC303 (CXL5504M)
クロマ信号マトリクス回路
Y信号プロセス回路
(2) エンコーダー回路
IC304 (CXA1392R)
(3) クロマ信号クシ形フィルター回路
IC305 (CXL5504M) とその周辺回路



(1) 信号処理系回路

クロマ信号マトリクス回路

1. C0信号, Y0信号分離
S1信号 (G + CyまたはMg + Ye) とS2信号 (Mg + CyまたはG + Ye) からC0信号 (2R − GまたはG − 2R) とY0信号 (2R + 3G + 2B) を分離する。
これらの信号はR, G, B信号をマトリクスするために用いられる。

・ C0信号はS2信号からS1信号を減算することで得られ, 次式に示すように2R − G信号と− (2B − G) 信号が線順次で交互に得られることになる。

(G + Cy) ／ (Mg + Ye) ライン :
C0 = (Mg + Ye) − (G + Cy)
= (R + B + R + G) − (G + G + B)
= 2R − G

(Mg + Cy) ／ (G + Ye) ライン :
C0 = (G + Ye) − (Mg + Cy)
= (G + R + G) − (R + B + G + B)
= − (2B − G)

・ Y0信号はS2信号とS1信号を加算することによって得られ, 次式に示すようにどのラインでも同一構成でバランスしている。

Y0 = (Mg + Ye) + (G + Cy)
= (R + B + R + G + G + G + B)
= 2R + 3G + 2B

2. C1信号作成回路
C0信号は2R − G信号 (CR信号) と− (2B − G) 信号 (CB信号) の線順次信号である。ところがR, G, B信号をマトリクスして作るにはCRとCBの両信号が同時に必要になる。このため1Hディレイした信号C1を作りC0信号とC1信号を加算して本信号を作る。
C0信号はIC302㊻PINから逆極性で出力される。次にIC301の㉓PINに入力されCCDディレイラインで1HディレイされC1信号となる。このCCD 1Hディレイライン駆動クロックがXDL1, XDL2でその周波数は455fH (= 7.16MHz) である。したがってクロマ信号に対しては余裕のあるサンプリング周波数になっている。
C1信号はIC301⑭PINから逆極性で出力される。次にQ303のバッファーを経てIC302㊽PINに入力されゲインコントロールアンプを経てRGBマトリクス回路へと出力される。ゲインコントロール回路ではIC302の㊼PIN電圧によってC1信号レベルがC0信号レベルと等しくなるように設定される。

3. Y1, Y2信号作成回路
Vアパーチャー信号を作るためにはY0, Y1, Y2の3信号を必要とする。またY0, Y1信号はRGB信号マトリクス用Y信号として使用する。
Y0信号はIC302の㊷PINから正極性で出力される。次にY0信号はIC301の③PINに入力されCCD 1Hディレイラインで1HディレイされてY1信号になる。このCCD 1Hディレイラインの駆動クロック周波数は455fH (= 7.16MHz) である。したがってRGB信号マトリクス用またはVアパーチャー信号用のY信号に対しては十分なサンプリング周波数になっている。
Y1信号はIC301の⑪PINから逆極性で出力される。次にQ302のバッファーを経てIC302㊺PINに入力されゲインコントロールアンプを経てY0信号と加算されてマトリクス回路へと出力される。
ゲインコントロール回路ではIC302の㊹PIN電圧によってY1信号レベルがY0信号レベルと等しくなるように設定される。Y2信号は同様にY1信号を更に1Hディレイされて作られる。

4. RGBマトリクス回路
原色信号処理を行うためにC0, C1, Y0＋Y1の3信号からR, G, Bの3信号を作る。
・C0, C1信号（いずれもCR信号とCB信号の線順次信号）からCR, CBの2つの連続信号を作る。
C1信号がCR信号のとき：
C0信号はCB信号になっている。したがってC1信号とC0信号を加算することによってCR信号（C1信号）とCB信号（C0信号）が同時化される。
C1信号がCB信号のとき：
C0信号はCR信号になっている。したがってC1信号とC0信号を加算することによってCB信号（C1信号）とCR信号（C0信号）が同時化される。
・Y0信号とY1信号を加算してRGB信号マトリクス用Y信号とする。
・CR, CB, Yの3信号からR, G, Bの3信号を作る。
R信号：
$R = CR + \alpha \cdot Y$
$\alpha$はIC302㊺PIN電圧によって設定される。
B信号：
$B = -CB + \beta \cdot (Y - CR)$
$\beta$はIC302㊷PIN電圧によって設定される。
G信号：
$G = Y - CR + CB$

5. ホワイトバランス回路
RGBマトリクス回路で作られたRGB信号は次にホワイトバランス回路にて，カメラが撮像している被写体の色温度に対してホワイトバランスがとれるように処理される。
まず，R信号とB信号は可変ゲインアンプに，G信号は固定ゲインアンプに入力される。これら可変ゲインアンプの利得はそれぞれIC302㊲PIN電圧（R GAIN），㊵PIN電圧（B GAIN）によって，INDOOR（色温度3200K）に於けるホワイトバランスに設定される。
次に，R信号とB信号は第二の可変ゲインアンプに，G信号は第二の固定ゲインアンプに入力される。
これら第二の可変ゲインアンプはIC202㊳PIN電圧（R CONT），㊴PIN電圧（B CONT）によって制御される。
これらの電圧はEN-97基板より出力される。

6. ATW回路
IC302から出力されたホワイトバランス検出用信号（WBR, WBG, WBB）を検波した後、Gの検波電圧に対してRとBの検波電圧をIC306において比較演算し、G信号にR, B信号を一致させる事で、WBを適正値に追い込む動作を続ける。

7. γ補正回路
RGBの各信号は，γ補正回路にて処理されて次段の色差マトリクス回路に送られる。

8. 色差マトリクス回路
NTSCカラー信号を作るために色差信号を作る必要がある。またここでは色再現の調整も行っている。色差マトリクス回路では次式によって色差信号を作る。
$R - Y = 0.7\ (R - G) - 0.11\ (B - G)$
$B - Y = 0.3\ (R - G) - 0.89\ (B - G)$
色差信号R－Y，B－Yはそれぞれ色相補正信号R－Y HUE，B－Y HUEを加算されIC302⑳,⑲PINに出力される。

Y信号プロセス回路
TG-89基板から出力されたYH信号は，FL301のローパスフィルター，FL302のディレイラインを通ってIC302の㉞PINに入力される。

1. γ補正回路
YH信号は，γ補正回路にて処理されて次段のYH信号1Hディレイ回路に送られる。

2. YH信号1Hディレイ回路
IC303を中心としたYH信号1Hディレイ回路は，YH信号に対するクロマ信号系の遅れを補正するために挿入されている。また，1HディレイしたYH信号を利用して，クシ形フィルターのかかったHアパーチャー用のYH信号を作る。
IC302の④PINから出力されたYH信号はIC303の①PINに入力される。ここではCCDディレイラインを通って，更に外付けのローパスフィルターFL303（230 nsecDL）を通って，ちょうど1Hのディレイ量となるように設計されている。このCCDディレイライン駆動用クロック周波数は910fHである。

3. YH信号ゲイン調整回路
次に，YH信号は再びIC302の②PINに入力され，YH信号1Hディレイ回路で減衰した分をゲイン調整回路で補正して，⑤PINから出力されて更にY／C位相合わせ用のディレイラインFL304（70nsec）を通ってエンコーダーIC304に入力される。

(2) エンコーダー回路

クロマ信号エンコーダー回路
R－Y, B－Yの色差信号をNTSCクロマ信号にエンコードする。R－Y信号はバーストを付加され＋90° 位相の3.58MHzキャリアによって平衡変調される。
B－Y信号はバーストを付加され0° 位相の3.58MHzキャリアによって平衡変調される。
変調されたR－Y, B－Y信号は加算され直交変調波となりIC302⑯PINより出力し, IC305を中心としたクロマクシ形フィルター回路ブロックを通り, 外付けの3.58MHzバンドパスフィルターを通ったのち再びIC302⑱PINに入力され, 輝度信号とミックスされて㉑PINからコンポジットビデオ信号として出力される。

Y信号エンコーダー回路
1. アパーチャー補正回路
この回路にて映像信号の輪郭を強調し, 視覚上の解像度を上げる。Hアパーチャー信号によって画面上の縦の線が強調され, Vアパーチャー信号によって画面上の横の線が強調される。
IC304の㊵PINに入力されたYH信号は, Hアパーチャー補正信号およびVアパーチャー補正信号を加算され次段に出力される。
Hアパーチャー補正信号を作るためのディレイラインはFL306で, FL304と同じく, グループディレイ70nsecのものを使用している。この信号は㊱PIN電圧によってレベル調整された後, ノイズスライスされ, 本信号に加算される。なお, 低照度の被写体においてはIC304の㊱PIN電圧が, AGC CONT電圧によって吊り上げられ, 設定電圧が上り, これによってHアパーチャー補正信号のレベルを低下させノイズを低減している。
またノイズスライスレベルは㊳PIN電圧により設定される。
Vアパーチャー信号はIC302で作られ, Y信号との位相合わせ用ディレイラインFL305を通ってIC304に入力されてY信号に加算される。

2. Yゲイン回路
この回路にてカメラのY信号出力レベルを規定値にする。調整はRV314で行う。

3. ホワイトクリップ回路
この回路にてカメラのY信号のピーク値を制限する。調整はなく, 固定抵抗によるプリセット値である。

4. セットアップ回路
この回路にてカメラのY信号の黒レベル設定を規定値にする。調整はRV313で行う。

5. 同期信号付加回路
この回路にてカメラのY信号に同期信号を付加して, 後段でクロマ信号とミックスされて㉑PINからコンポジットビデオ信号として出力される。

(3) クロマ信号クシ形フィルター回路
IC305を中心とした回路はクロマ信号クシ形フィルター回路である。この回路はクロマ信号からY信号のクロストーク成分を除去する。

## 4-1-4. EN-97基板

この基板には、各基板の各回路ブロックに必要なDC電源を送るDC／DCコンバータがある。またその他に下記の回路ブロックがある。

(1) 外部同期分離回路
(2) ビデオ信号ドライバー回路
(3) モード切り換え回路
(4) CCDアイリス回路

(1) 外部同期分離回路

外部同期信号が入力されると、Q601～Q603, IC607～IC609, IC617で構成される回路で同期分離され、PR-153基板に出力される。

PR-153基板から送られた位相比較用のFH信号は、モノマルチIC625で位相調整され、PR-153基板に出力される。またFHパルスは、Q607, IC626, IC627で構成される回路で、2FHパルスとなり、IC608シフトレジスターのCK入力となる。

IC608は、HD, VD外部同期時、VDの位相を遅らせてPR-153基板に出力する。

(2) ビデオ信号ドライバー回路

PR-153基板から送られて来た、VBS, Y／C, R-Y, B-Y信号を、アナログスイッチIC612, 613で切り換え、ビデオドライバーIC614, 615を通して、CN-519基板に出力する。

また、CMA-999が接続された時は、自動的に、Y, R-Y, B-Y信号が出力される。

(3) モード切り換え回路

スイッチS601アナログスイッチIC610, IC606を切り換える事により、以下のモード切り換えが出来ます。

| | |
|---|---|
| AGC …… | ON／OFF |
| ホワイトバランス…… | 3200K／5600K／ATW／MANUAL |
| シャッターモード…… | OFF／1/1000／FL／CCD IRIS |

(4) CCDアイリス回路

被写体の光量に応じて、シャッタースピードを自動制御することにより、オートアイリスレンズと同様な働きをすることができる。

PR-153基板から入力されるIRIS DET信号をDCに変換し、IC624で増幅する。

基準となるV周期の比較波形は、IC601, 605, Q604, 605を中心とした回路で作られる。

この2つの信号をIC623で比較する。

この出力信号は、IC620～622, IC604で構成されるX SUB発生回路に入力し、その出力はPR-153基板に送られる。

## 4-2. CMA-999回路概説

### 4-2-1. SG-185基板

この基板には、各基板の各回路ブロックに必要なDC電源を送るDC/DCコンバータがある。またその他に下記の回路ブロックがある。

(1) 同期信号発生回路
(2) 外部同期回路

(1) 同期信号発生回路

IC15は、CL (910fH), 4fscを入力することにより各種タイミング信号を発生する。

- SYNC : コンポジットSYNC信号
- BLK : ブランキング信号
- HD, VD : 水平、垂直同期信号
- BF : バーストフラグ信号
- SC : サブキャリア信号

(2) 外部同期回路

外部から入力されるVBS信号は、SYNC信号と、クロマ信号に分離される。
SYNC信号は、アナログスイッチIC3で切り換えられ、GENLOCK IC IC14に送られる。
ここでHRとVR信号に分離される。
VR信号はそのままIC15へ入力される。
IC15のFH信号は、IC5(モノマルチ)で位相を調整され、IC14に入力される。位相調整は、CN-517基板のRV3で行われる。
FH信号は、IC14内部でHR信号と位相比較される。その比較出力は、ローパスフィルターを通り、CL用VCOのコントロール電圧となる。
クロマ信号は、増幅されIC14に入力される。ここでIC15からの内部のSC信号と位相比較される。比較出力は、ローパスフィルターを通り、4fsc用VCOのコントロール電圧となる。
またSC信号は、IC6で位相を調整され、IC8で0/πの選択をされた後、ローパスフィルター、バンドパスフィルターを通り、EN-98基板に出力される。位相調整は、CN-517基板のRV2で行われる。0/π切り換えは、CN-517基板のS1で行う。

### 4-2-2. EN-98基板

この基板は、XC-999より入力されるY/R-Y/B-Y信号から、VBS, Y/C, R/G/B信号を発生している。
また、SYNC, HD, VD信号を75Ωドライバーを通して出力する。
CN-516基板より入力されるR-Y, B-Y信号は、IC1で増幅されディレーラインを通りエンコーダーIC(IC7)に入力される。
Y信号は、バッファーを通りIC7に入力される。そしてIC7の内部のマトリクス回路を通りR/G/B信号として出力される。さらに、ホワイトクリップ、セットアップ回路を通り、75Ωドライバーを通ってCN-516基板に出力される。
なお、G信号のみにSYNC信号をMIXしている。
また、SC信号をIC7に入力し、R-Y/B-Y信号を変調し、クロマ信号として出力する。
クロマ信号は、クリーニング回路を通る。そしてディレーラインを通って来たY信号とMIXされVBS信号となり、75Ωドライバーを通って出力される。NTSCのみ、クロマ信号は、COMフィルターを通る。
また、Y, C信号は、Y/C信号として、75Ωドライバーを通って出力される。

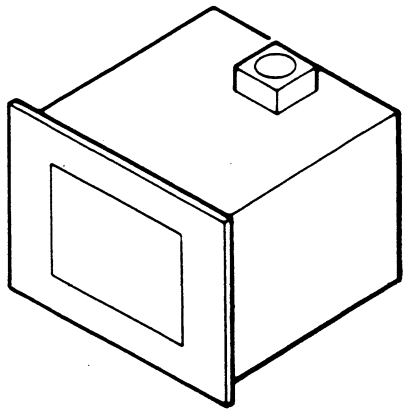
# 第5章
# 調整要項

## 5-1. 準備

### 5-1-1. 調整用治具および測定器具

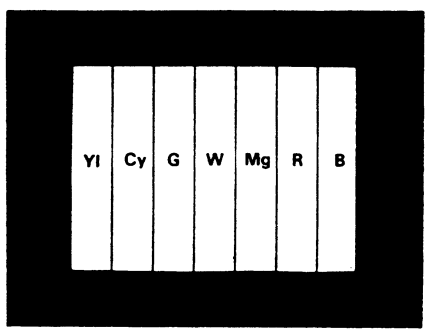
| J-6029-140-A | パターンボックス PTB-500 |
|---|---|

・調整用チャート光源用 AC90～240V

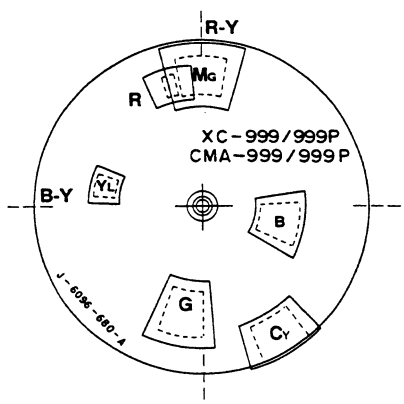


| J-6020-250-A | カラーバーチャート |
|---|---|

・色調整用

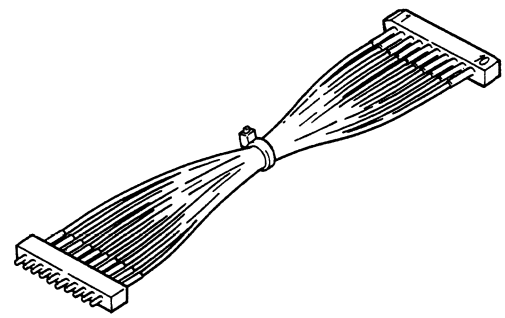



| J-6096-680-A | カラー調整枠 |
|---|---|



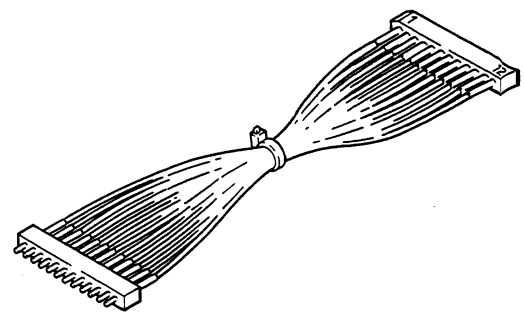

| J-6096-610-A | 延長ハーネス (10P) |
|---|---|

・EN-98基板を延長するときに使用します。



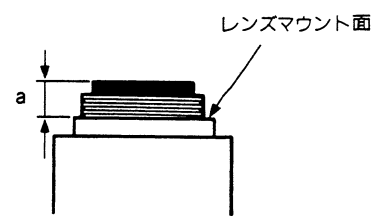
| J-6096-620-A | 延長ハーネス (12P) |
|---|---|

・EN-98基板を延長するときに使用します。



市販品

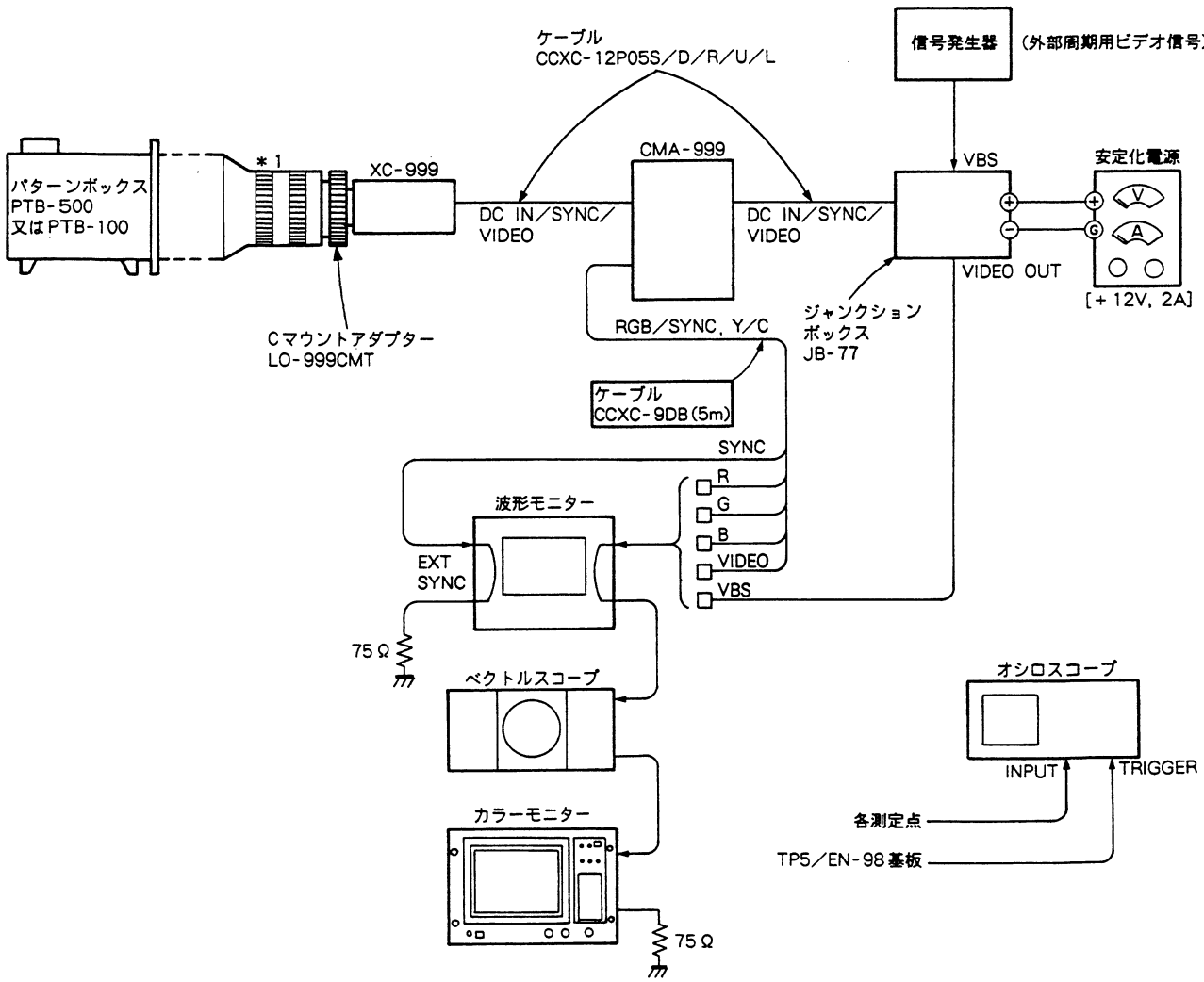
- 二現象オシロスコープ
- ベクトルスコープ
- 波形モニター
- 周波数カウンター
- デジタル電圧計
- カラーモニター
- レンズ（Cマウントで，手動アイリスのもの）
  （Cマウント式レンズを取り付ける場合は、Cマウントアダプター LO-999CMT が必要です。）




注）ただし，レンズマウント面からの飛び出し量aが，4.1mm以下のものに限る。

## 5-1-2. 機器接続図

調整を実施する場合は，汎用の直流電源（DC12V）と Junction Box（JB-77）を使用し,下図のように接続して下さい。




注意：＊1

a) この調整要項は、Cマウントタイプで，マニュアルアイリスのレンズを使用していることを前提に書かれています。C マウントレンズをカメラに取り付ける場合は，LO-999CMT が必要です。

b) VCL-06S12XMまたはVCL-12S12XMのレンズを使用する場合は，レンズとパターンボックスの距離を短くして下さい。この場合，実際の波形が，このマニュアルに記載されている波形と若干異なることがあります。

## 5-2. CMA-999調整

準備：
1. XC-999をセッティングする。
2. カラーバー標準画枠撮像時，白レベルを100 IRE ／700 mVに合わせる。
3. XC-999とCMA-999を接続する。

### 5-2-1. VCOコントロール電圧調整

測定器　　：デジタル電圧計
準備　　：
1. 延長ハーネス（10P, 12P）でEN-98基板を延長します。
2. 外部同期信号を入力する。

調整手順
1. 測定点　：TP6／SG-185基板
   調整箇所：◐CT101／SG-185基板
   規格　　：3.2 ± 0.05 Vdc
2. 測定点　：TP7／SG-185基板
   調整箇所：◐CT102／SG-185基板
   規格　　：3.0 ± 0.05 Vdc

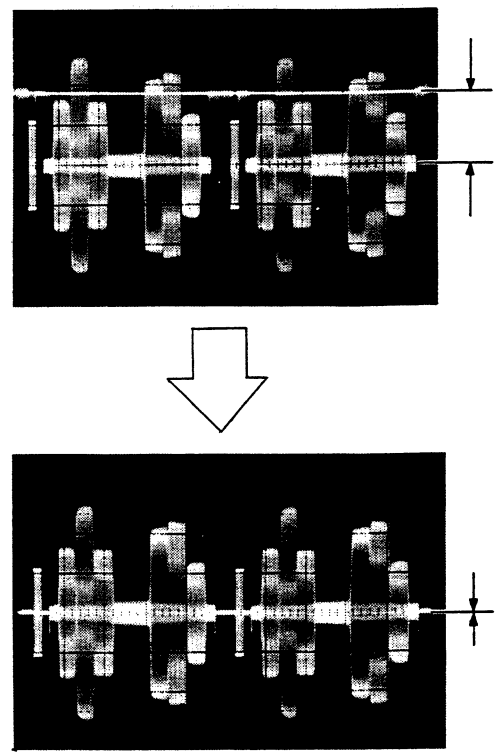
注意：調整終了後，EN-98基板を本体に戻します。

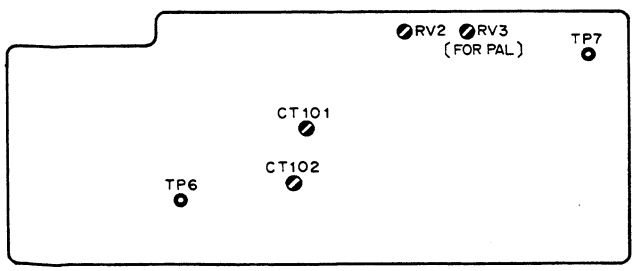
### 5-2-2. INT SC周波数調整

測定器　：周波数カウンター
測定点　：TP4／EN-98基板
調整箇所：◐RV2／SG-185基板
規格　　：3.579545MHz ± 10Hz

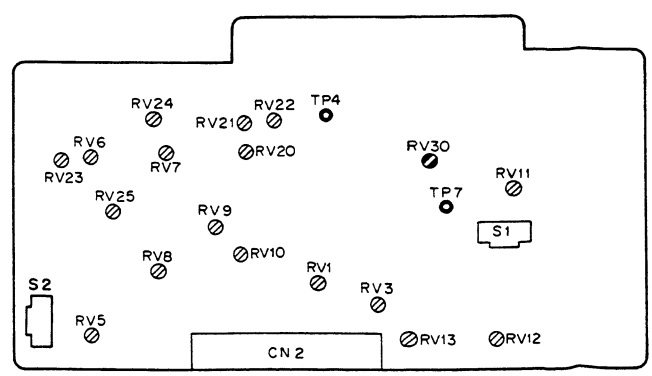
### 5-2-3. クロマ BLKGクリーン調整

測定器　：オシロスコープ
測定点　：TP7／EN-98基板
調整箇所：◐RV30／EN-98基板
規格　　：BLKG部の段差が無くなるように◐RV30を調整します。





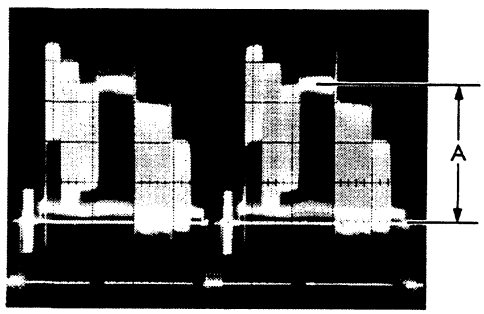
SG-185/185P Board
-A Side-



EN-98/98P Board
-A Side-

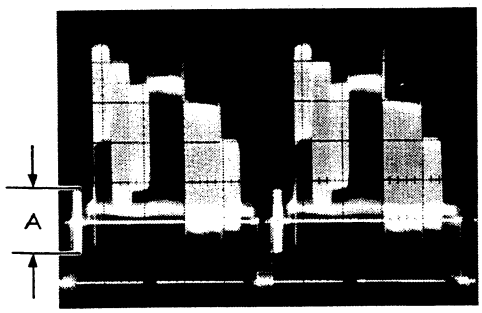
## 5-2-4. VBS OUT レベル調整

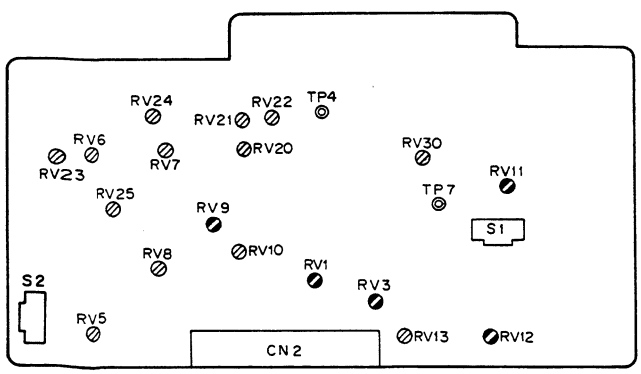
測定器　：波形モニター
準備　　：S1／EN-98基板 → OFF
測定点　：VBS OUT
調整箇所：◐RV9／EN-98基板
規格　　：A = 100 ± 2 IRE




## 5-2-5. バーストレベル調整1

測定器　：波形モニター
測定点　：VBS OUT
調整箇所：◐RV12／EN-98基板
規格　　：A = 41 ± 1 IRE

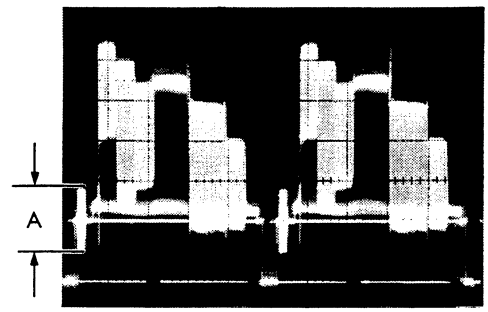



EN-98/98P Board
—A Side—

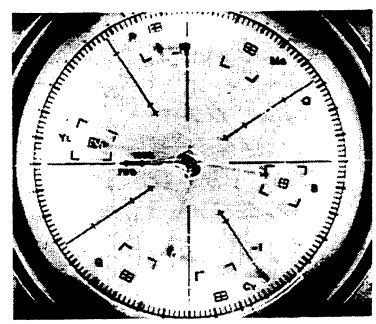
## 5-2-6. バーストレベル調整2

測定器　：波形モニター
準備　　：S1／EN-98基板 → ON
測定点　：VBS OUT
調整箇所：◐RV11／EN-98基板
規格　　：A = 41 ± 1 IRE



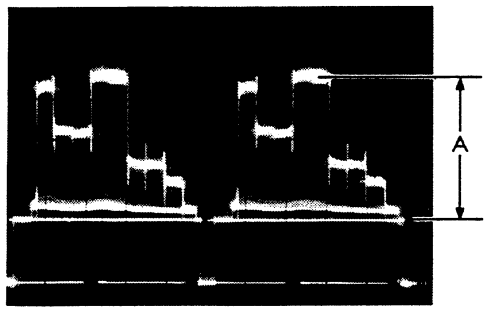

## 5-2-7. 色再現調整

測定器　：ベクトルスコープ
測定点　：VBS OUT
調整箇所：◐RV1, ◐RV3／EN-98基板
規格　　：カラーバー標準画枠撮像時にて,色再現枠に各輝点が入るように◐RV1, ◐RV3を調整する。



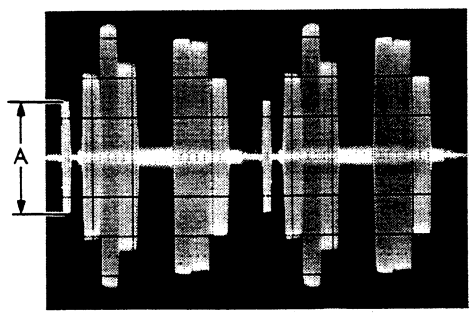
## 5-2-8. Yレベル調整

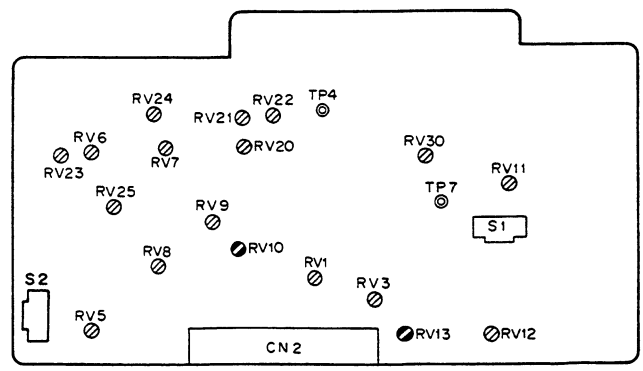
測定器　：オシロスコープ
測定点　：CN2-17ピン（GND：1ピン）／EN-98基板
調整箇所：◐RV10／EN-98基板
規格　　：A ＝ 714±15 mV（75Ω終端）




## 5-2-9. クロマレベル調整

測定器　：オシロスコープ
測定点　：CN2-19ピン（GND：1ピン）／EN-98基板
調整箇所：◐RV13／EN-98基板
規格　　：A ＝ 300±5 mV（75Ω終端）



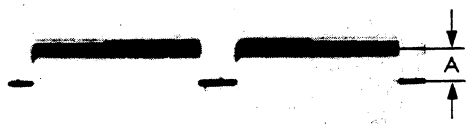

EN-98/98P Board
–A Side–

## 5-2-10. R／G／B OUT調整

測定器　：波形モニター
調整手順
1. セットアップレベル調整
準備　　：レンズ絞り　→　クローズ
調整　　：R-ch, G-ch, B-ch毎に下記のように調整します。

EN-98基板

| | 測定点 | 調整箇所 | セットアップレベル |
|---|---|---|---|
| R-ch | R OUT | ◐RV23 | A = 4 ± 1 IRE |
| G-ch | G OUT | ◐RV24 | |
| B-ch | B OUT | ◐RV25 | |



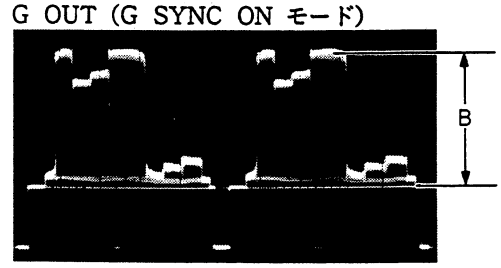

2. ビデオアウトレベル調整
被写体　：カラーバーチャート
準備　　：VBS OUT レベルが100 IRE／700 mVになるようにレンズ絞りを調整します。
調整　　：R-ch, G-ch, B-ch毎に下記のように調整します。

EN-98基板

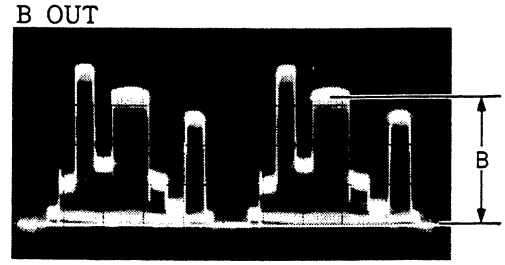
| | 測定点 | 調整箇所 | 白のレベル |
|---|---|---|---|
| R-ch | R OUT | ◐RV6 | B = 100 ± 2 IRE |
| G-ch | G OUT | ◐RV7 | |
| B-ch | B OUT | ◐RV8 | |

R OUT

G OUT (G SYNC ON モード)




B OUT

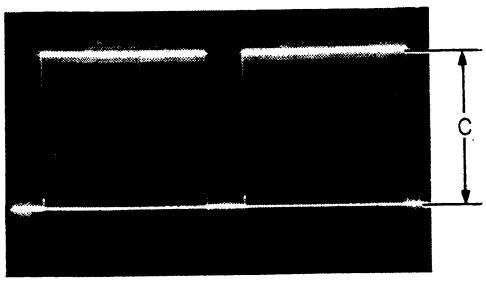


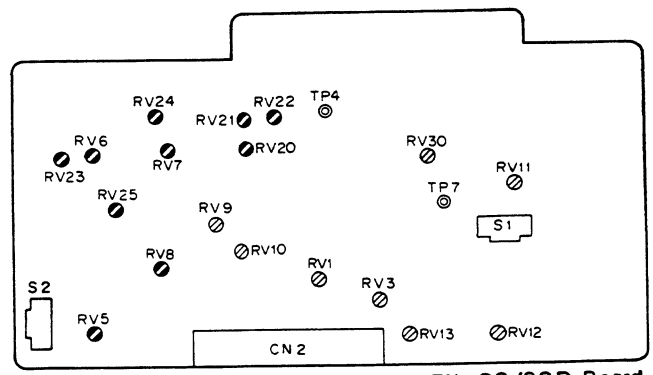
3. ホワイトクリップ調整

被写体　：全面白（パターンボックスの白部分）
準備　　：レンズ絞り　→　開放
調整　　：R-ch, G-ch, B-ch毎に下記のように調整します。

EN-98基板

| | 測定点 | 調整箇所 | ホワイトクリップレベル |
|---|---|---|---|
| R-ch | R OUT | ◐RV20 | C＝110 ± 5 IRE |
| G-ch | G OUT | ◐RV21 | |
| B-ch | B OUT | ◐RV22 | |



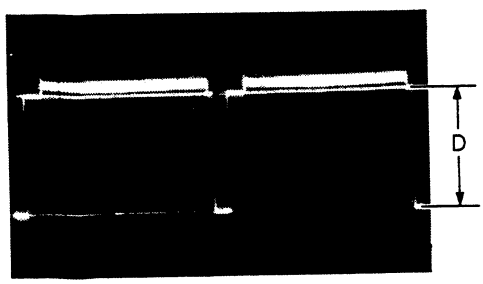




EN-98/98P Board
—A Side—

4. G OUT SYNC LEVEL調整

注意事項：G OUTのSYNC付加ON／OFFの設定をONにした場合に必要な調整です。

準備　　：レンズ絞り　→　クローズ
測定点　：G OUT
調整箇所：◐RV5／EN-98基板
規格　　：D＝40 ± 1 IRE




・S2のスイッチがマウントされている基板もあります。
このスイッチは、SYNC付加をON／OFFするものです。

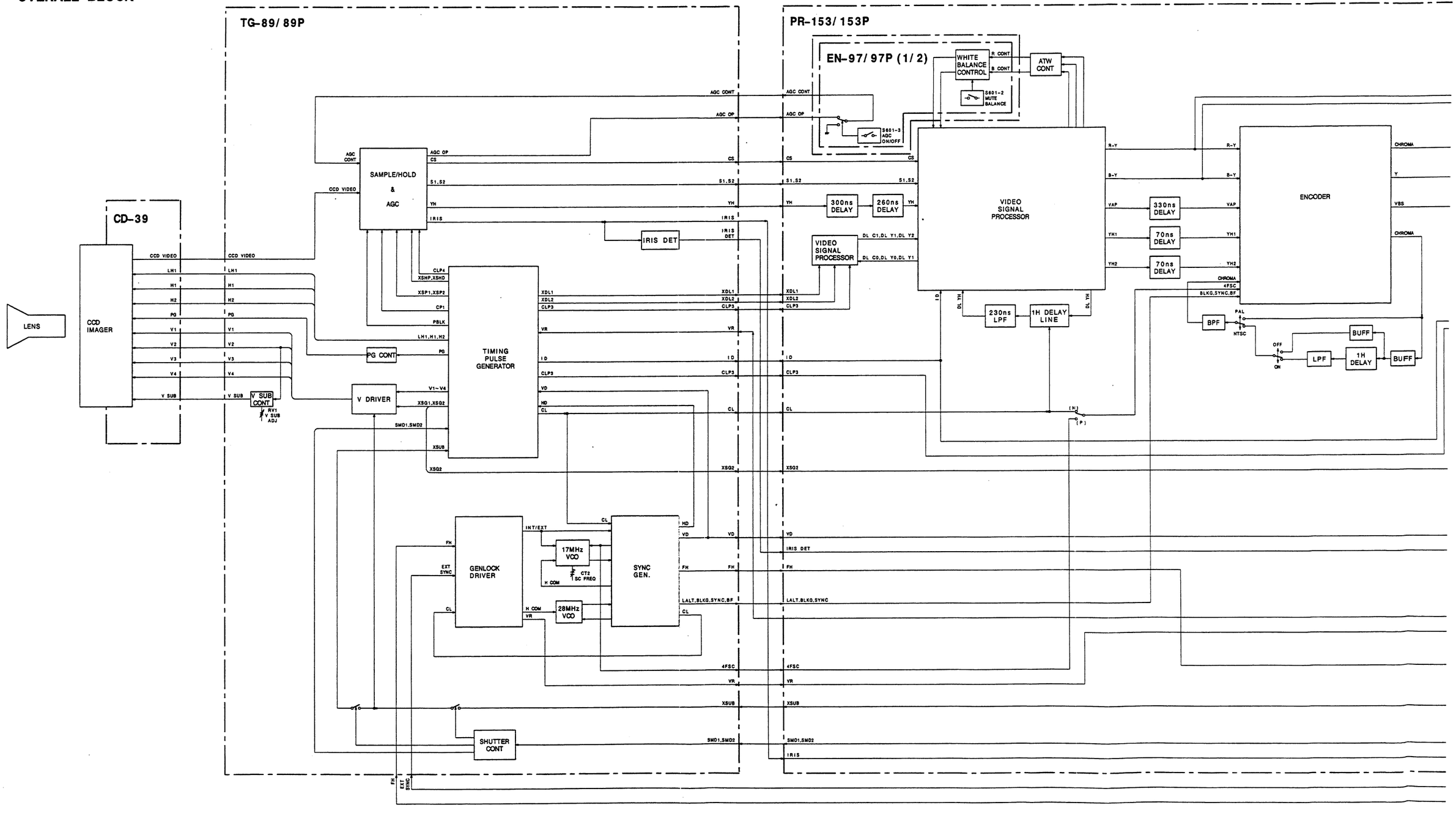
・S2のスイッチがないものは、SYNC付加のON／OFFを下記のようにジャンパースイッチで行います。

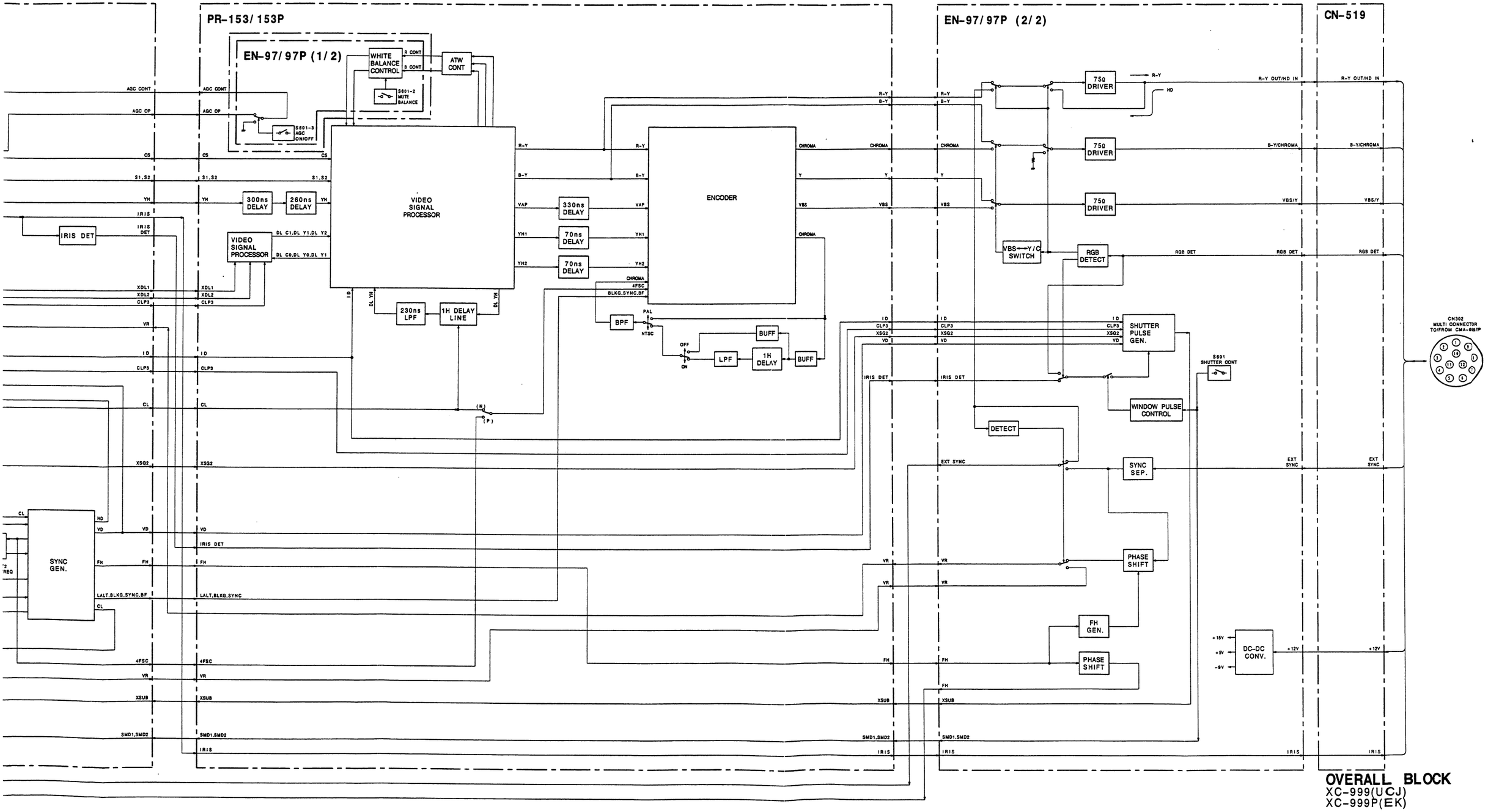
| モード | EN-98基板（B面） |
|---|---|
| SYNC付加 | JR3：OPEN<br>JR4：M't　（ジャンパースイッチ） |
| SYNCなし | JR3：M't<br>JR4：OPEN　（ジャンパースイッチ） |

# SECTION A
# BLOCK DIAGRAMS

## A-1.XC-999/999P BLOCK DIAGRAM

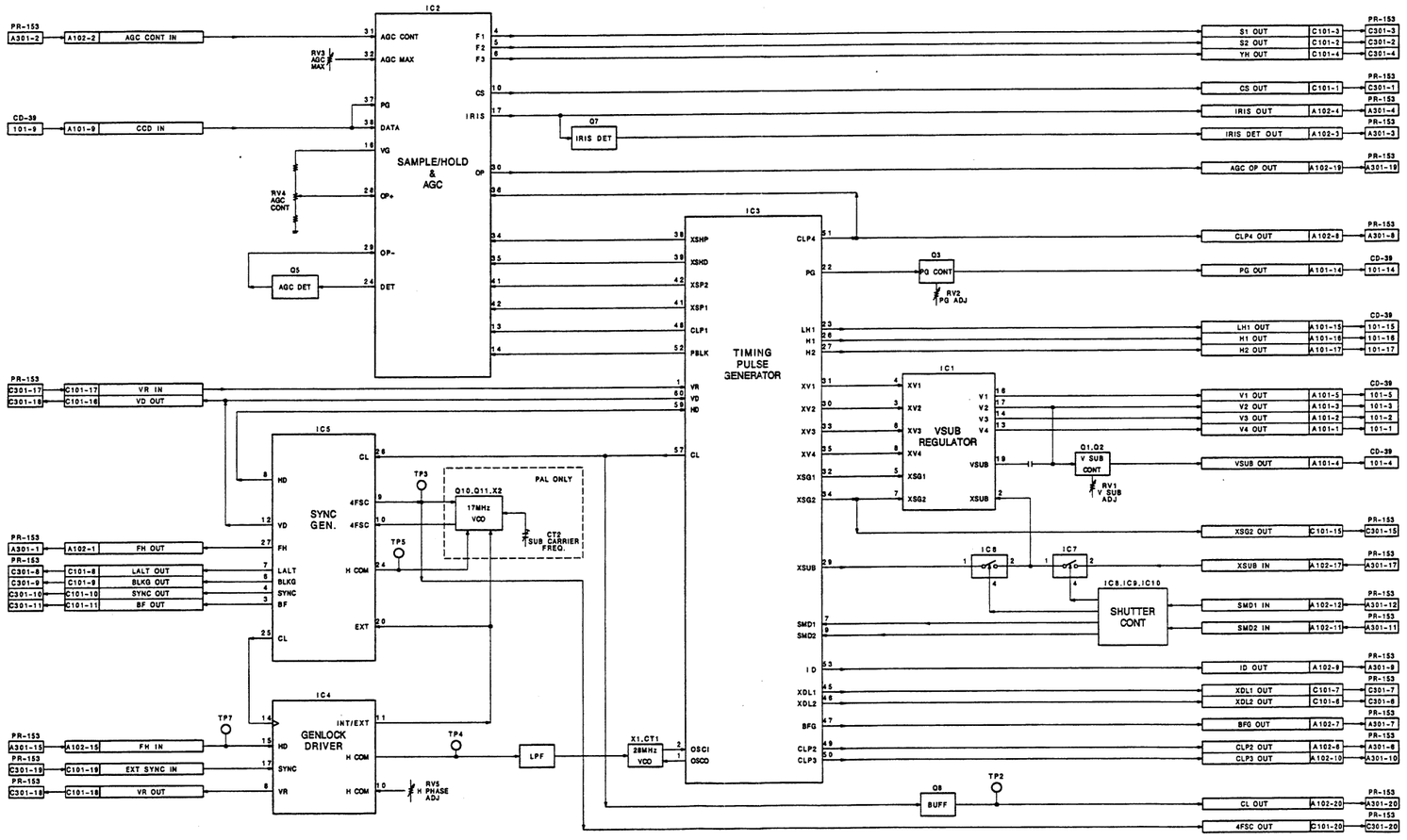
### OVERALL BLOCK





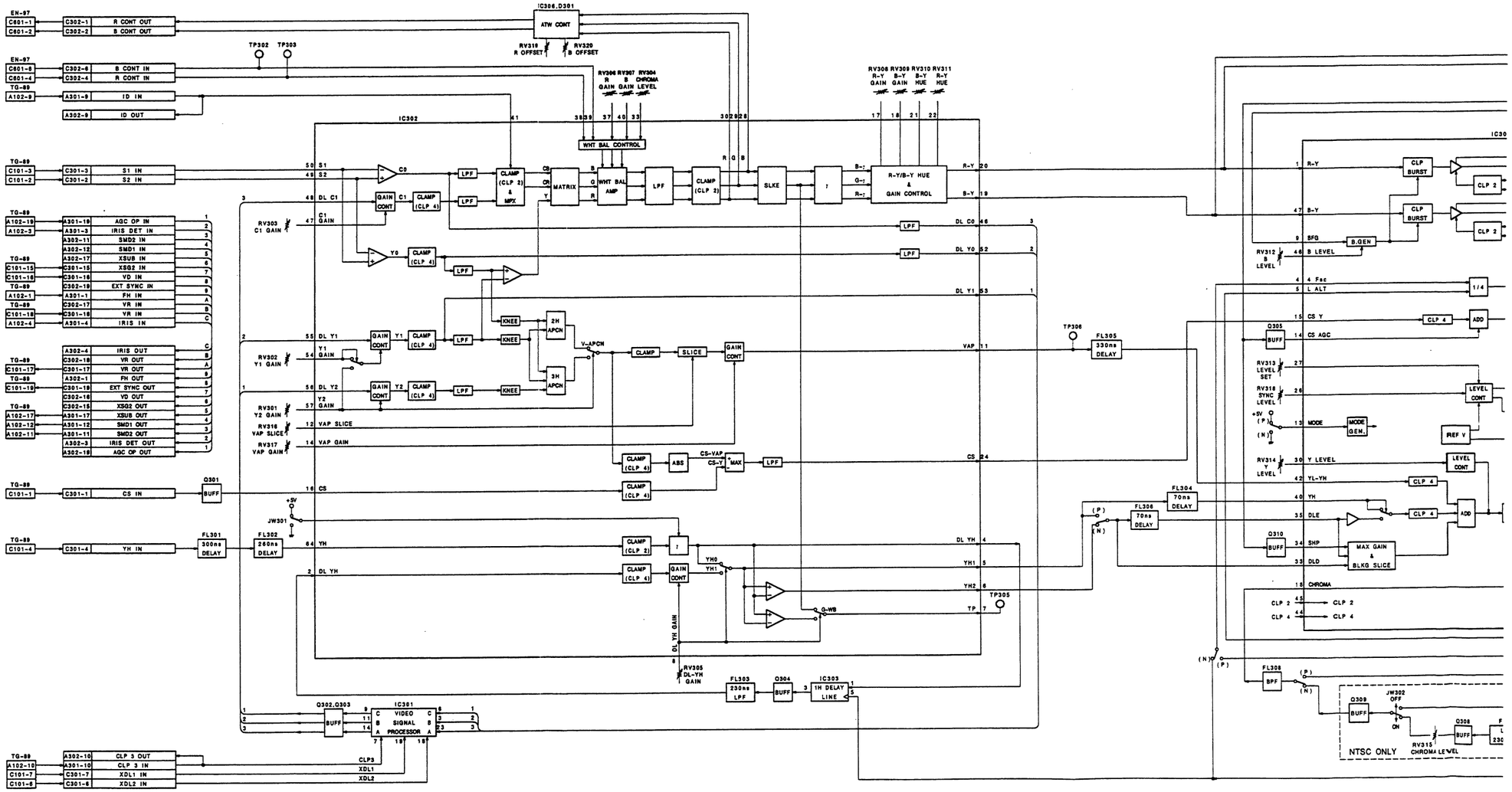

**OVERALL BLOCK**
XC-999(UCJ)
XC-999P(EK)

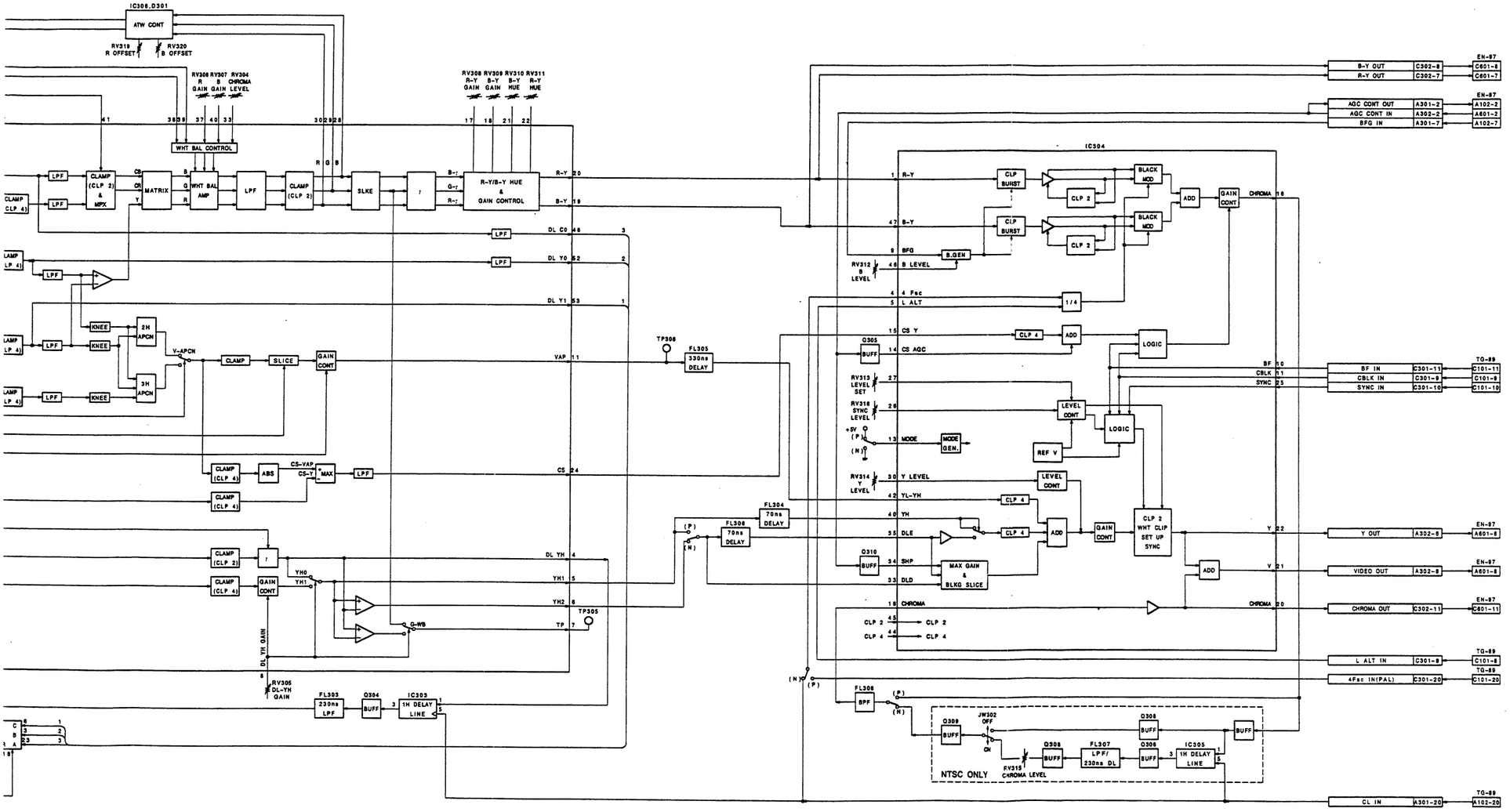
## TG-89/89P BLOCK




**TG-89 BLOCK**
XC-999(UCJ)
XC-999P(EK)

## PR-153/153P BLOCK

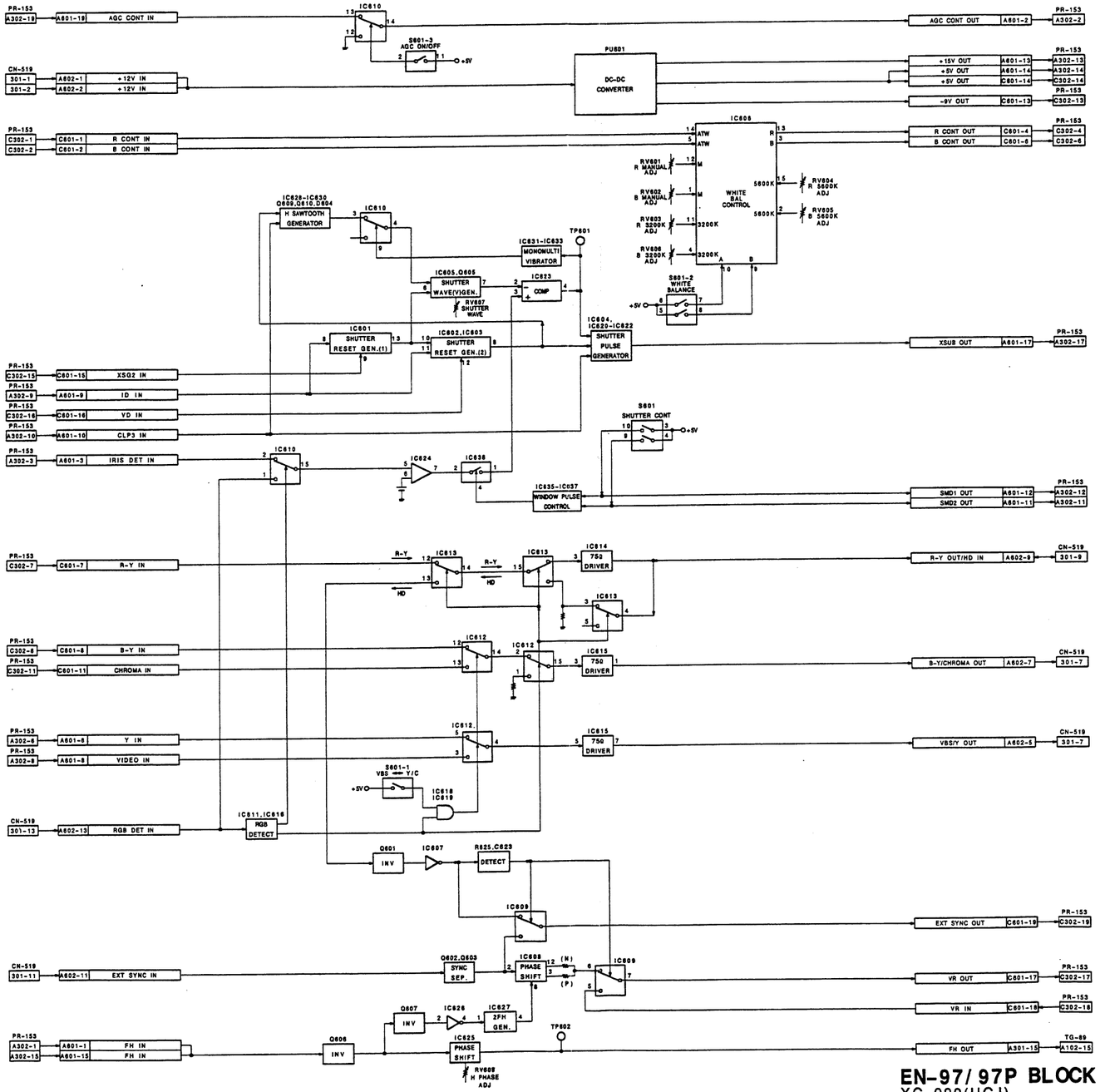





**PR-153/ 153P BLOCK**

XC-999(UCJ)
XC-999P(EK)

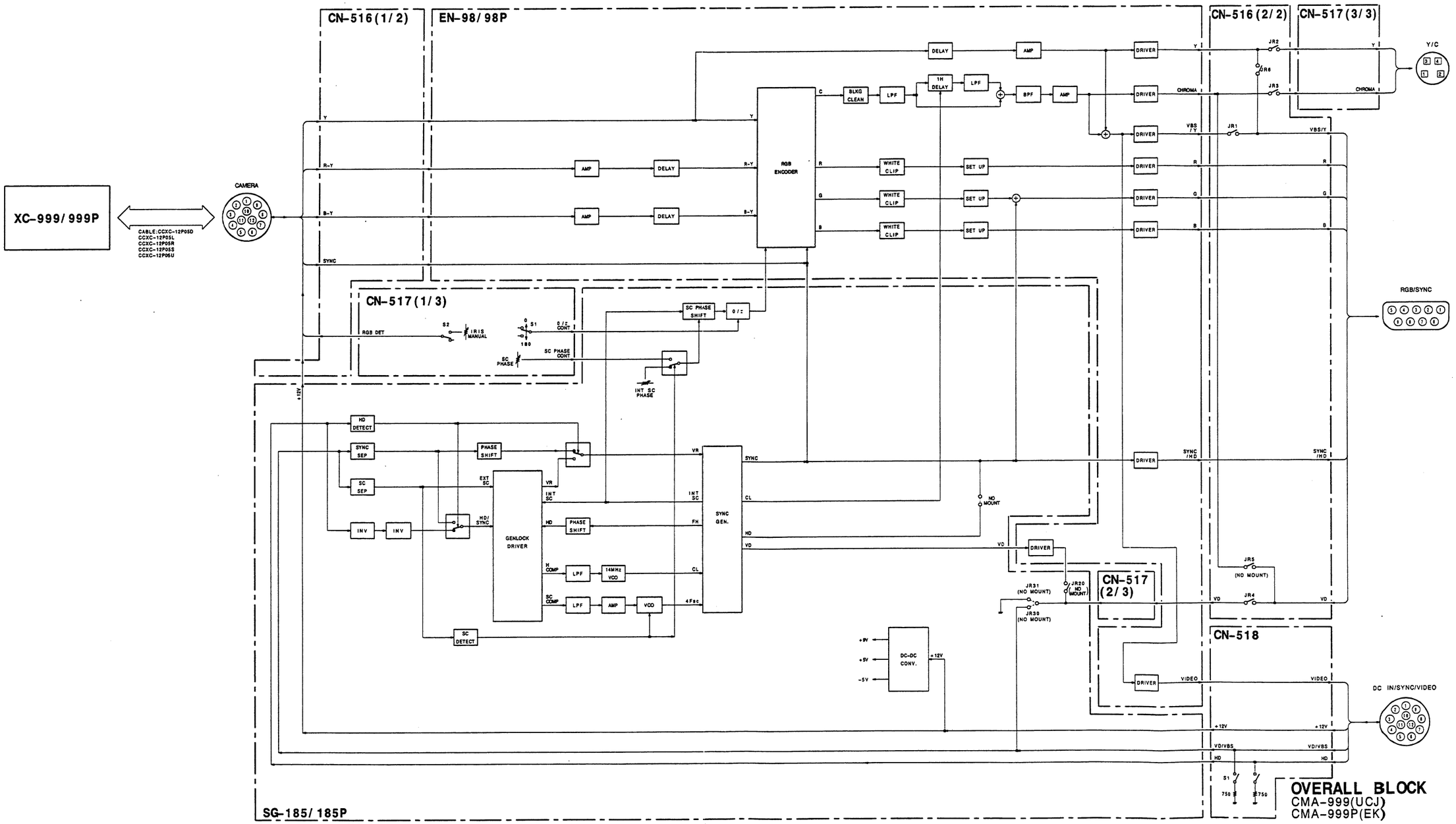
## EN-97/97P BLOCK



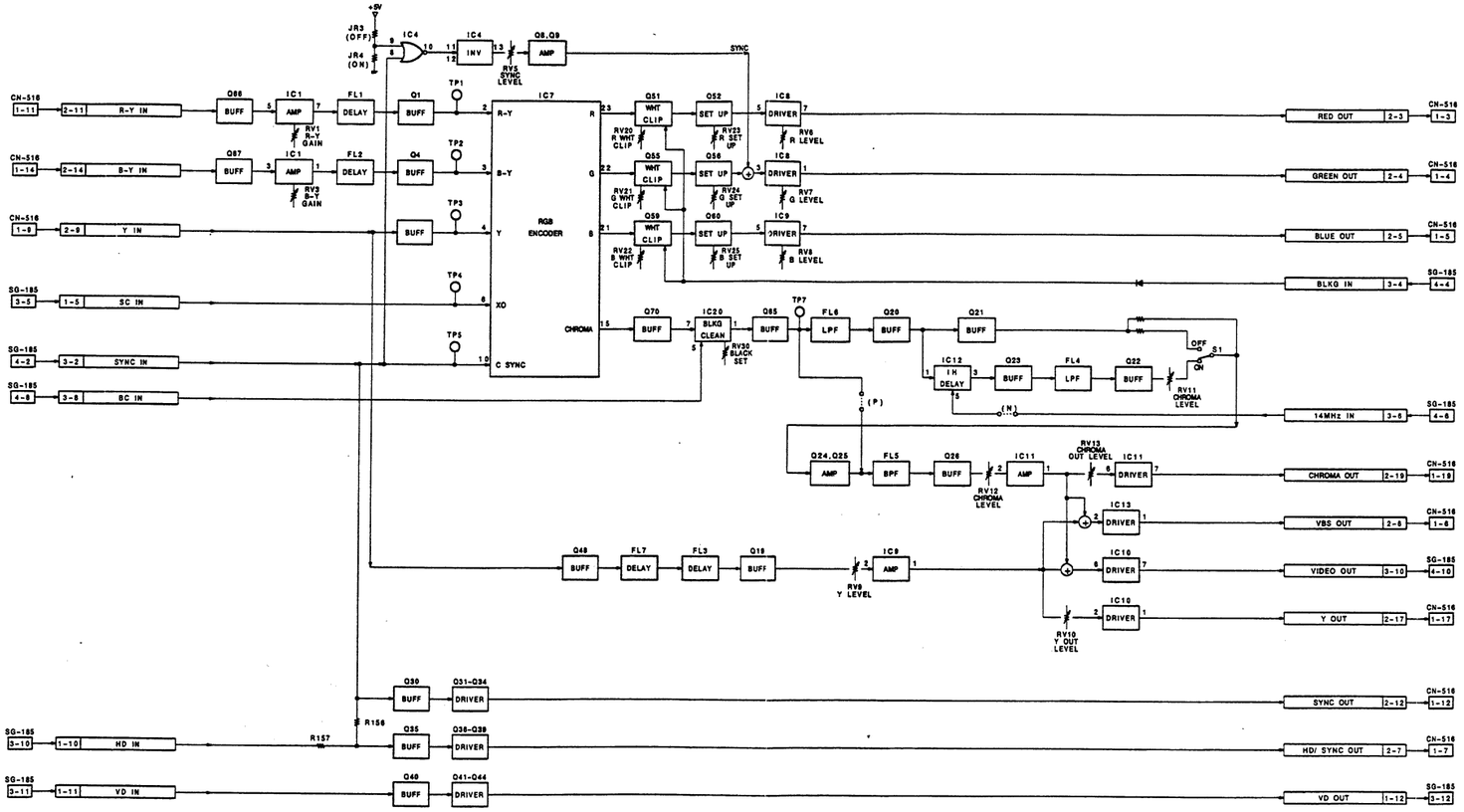

**EN-97/97P BLOCK**
XC-999(UCJ)
XC-999P(EK)

## A-2.CMA-999/999P BLOCK DIAGRAM

### OVERALL BLOCK

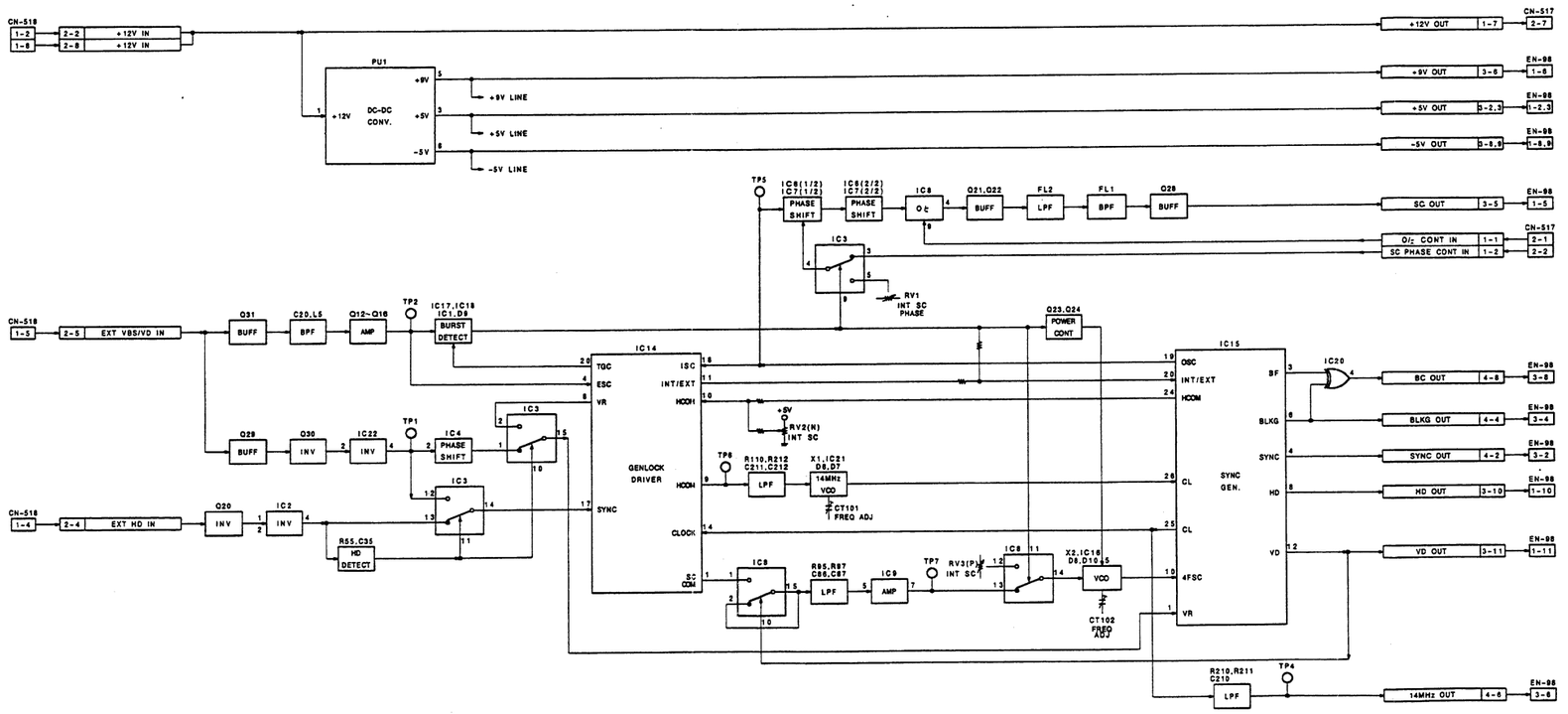


## EN-98/98P BLOCK




**EN-98/ 98P BLOCK**
CMA-999(UCJ)
CMA-999P(EK)

## SG-185/185P BLOCK




**SG-185/185P BLOCK**
CMA-999(UCJ)
CMA-999P(EK)

# SECTION B
# SEMICONDUCTOR

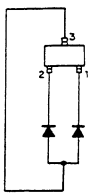
The circuit diagram of IC is obtaind from the IC data book published by the manufacture.


| | TYPE | PAGE |
|---|---|---|
| DIODE | 1SS181 | B-2 |
| | 1SS226 | B-2 |
| | D1FS4 | B-2 |
| | HVU350 | B-2 |
| | MA121 | B-2 |
| | MA141WA | B-2 |
| | MA143 | B-2 |
| | RD ? ?M | B-2 |
| TRANSISTOR | 2SA1576 | B-2 |
| | 2SA1791 | B-2 |
| | 2SC4081 | B-2 |
| | 2SC4656 | B-2 |
| | 2SK300 | B-2 |
| | UN5213 | B-2 |
| | XN1216 | B-2 |
| | XN1401 | B-2 |
| | XN1501 | B-2 |
| | XN4401 | B-2 |
| | XN4501 | B-2 |
| | XN4601 | B-2 |

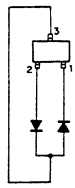
| | TYPE | PAGE |
|---|---|---|
| IC | CXA1219M | B-4 |
| | CXA1390AR | B-3 |
| | CXA1391R | B-4 |
| | CXA1392R | B-6 |
| | CXD1216M | B-7 |
| | CXD1217M | B-10 |
| | CXD1250N | B-7 |
| | CXD1252AR | B-8 |
| | CXL5504M | B-9 |
| | HD14053BFP | B-14 |
| | LM2903M | B-11 |
| | MC14538BF | B-11 |
| | MC14576AF | B-11 |
| | MC14577AF | B-11 |
| | NJM2406F | B-11 |
| | NJU7022M | B-11 |
| | SC7S04F | B-12 |
| | SC7S32F | B-12 |
| | SN74HC02ANS | B-12 |
| | SN74HC164NS | B-12 |
| | SN74LS123NS | B-13 |
| | TC4S30F | B-13 |
| | TC4S66F | B-13 |
| | TC4S71F | B-13 |
| | TC4W53F | B-13 |
| | TC74HC02AF | B-12 |
| | TC74HC164AF | B-12 |
| | TC7S00F | B-13 |
| | TC7S04F | B-12 |
| | TC7S08F | B-13 |
| | TC7S32F | B-12 |
| | TC7SU04F | B-12 |
| | UPC358G2 | B-13 |
| | UPC4062G2 | B-13 |
| | UPD5555G | B-14 |
| | UPD74HC4053G | B-14 |
| | XRU4052BF | B-14 |
| | XRU4053BF | B-14 |
| | μPD74HC157G | B-12 |
| | μPD74HC164G | B-12 |
| | μPD74HC74G | B-12 |

## <Diode>

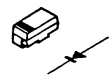
1SS181



1SS226

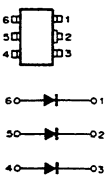


D1FS4

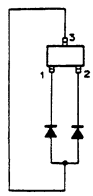


HVU350

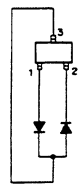
MA121



MA141WA



MA143



RD ? ?M

## <Transistor>

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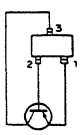

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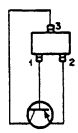

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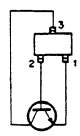

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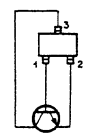
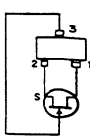
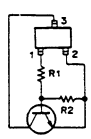


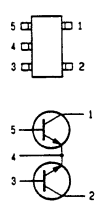
2SK300



UN5213



XN1216
XN1501



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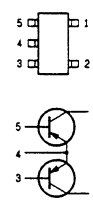

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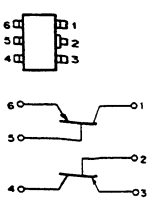

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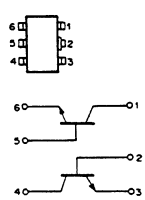
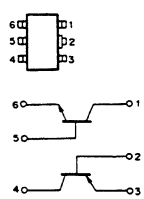


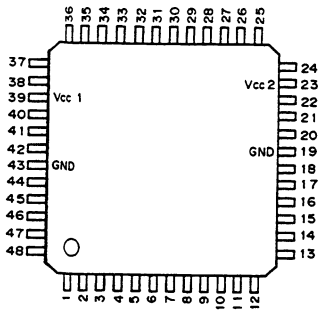
XN4601

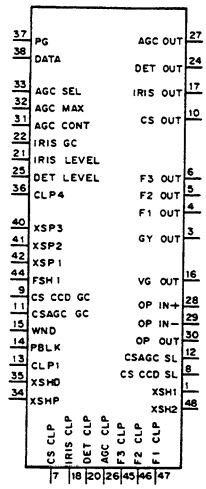


XC-999 (UCJ)
XC-999P (EK)
CMA-999 (UCJ)
CMA-999P (EK)

CXA1390AR (SONY)

C-MOS SAMPLE & HOLD AND AGC FOR CCD
– TOP VIEW –



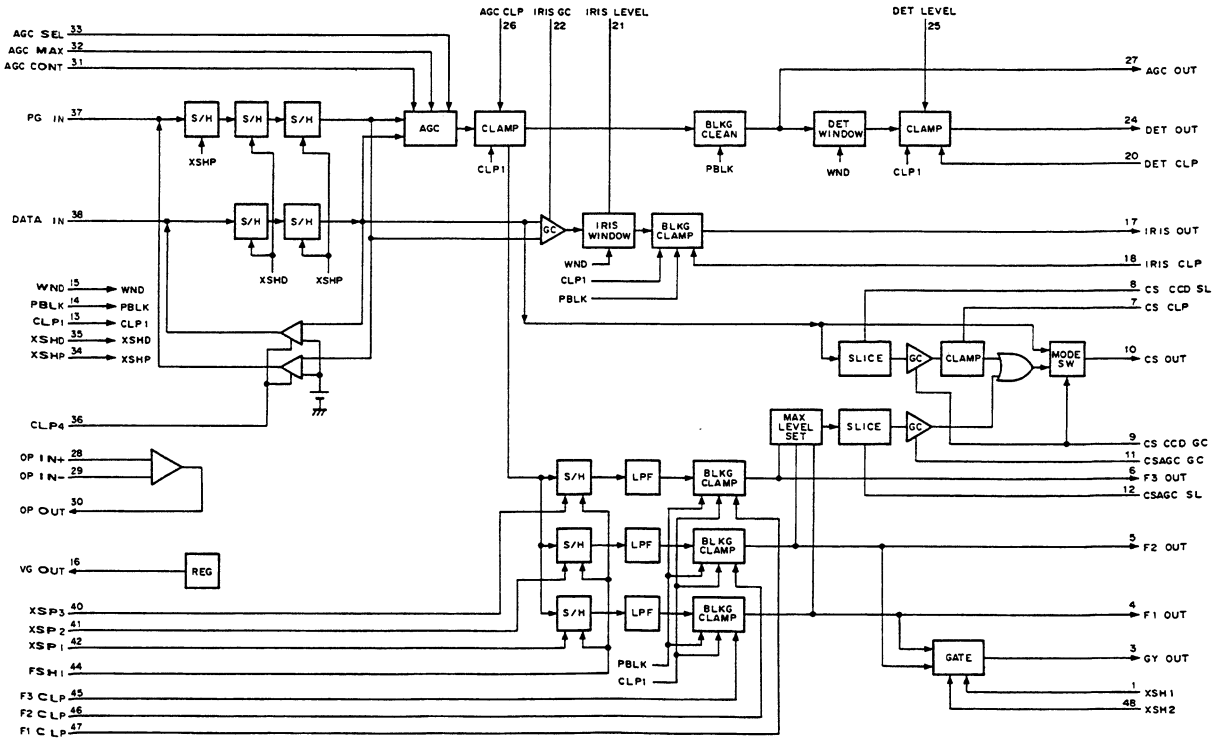

**INPUT**

| | |
|---|---|
| XSH1, XSH2 | : SAMPLE AND HOLD PULSE INPUTS FOR 1H DELAY LINE |
| XSHP, XSHD | : SAMPLE AND HOLD PULSE INPUTS FOR CCD IMAGER |
| XSP3, XSP2, XSP1 | : SAMPLE AND HOLD PULSE INPUTS FOR COLOR SEPARATION |
| CS CLP | : CLAMP INPUT FOR COLOR SEPARATION |
| IRIS CLP | : CLAMP INPUT FOR IRIS CONT |
| DET CLP | : CLAMP INPUT FOR SIGNAL DETECT |
| AGC CLP | : CLAMP INPUT FOR AGC |
| F3/F2/F1 CLP | : CLAMP INPUTS FOR F1, F2 AND F3 |
| CS CCD SL | : HIGH LUMINANCE DET LEVEL ADJ FOR INPUT SIGNAL |
| CS CCD GC | : HIGH LUMINANCE GAIN ADJ FOR INPUT SIGNAL |
| CSAGC GC | : HIGH LUMINANCE DET LEVEL ADJ FOR AFTER AGC |
| CSAGC SL | : HIGH LUMINANCE DET LEVEL ADJ FOR INPUT SIGNAL |
| IRIS LEVEL | : WEIGHT ADJ INPUT FOR DET OUTPUT |
| IRIS GC | : GAIN CONT INPUT FOR IRIS OUT |
| DET LEVEL | : WEIGHT ADJ INPUT FOR DET OUTPUT |
| AGC CONT | : AGC AMPLIFIER GAIN CONT INPUT |
| AGC MAX | : AGC AMPLIFIER MAX GAIN CONT INPUT |
| CLP1 | : CLAMP PULSE 1 INPUT |
| PBLK | : PRE BLKG PULSE INPUT |
| WND | : WINDOW PULSE INPUT |
| CLP4 | : CLAMP PULSE 4 INPUT |
| OP IN + | : NON-INVERTING INPUT OF OPERATIONAL AMPLIFIER |
| OP IN – | : INVERTING INPUT OF OPERATIONAL AMPLIFIER |
| AGC SEL | : GAIN SELECT FOR AGC AMPLIFIER |
| PG IN | : CCD SIGNAL INPUT |
| DATA IN | : CCD SIGNAL INPUT |
| FSHI | : LOCK SPEED ADJ INPUT FOR COLOR SEPARATION S/H |

**OUTPUT**

| | |
|---|---|
| GY OUT | : GY OUTPUT |
| F1, F2, F3 OUT | : F1, F2 AND F3 OUTPUTS |
| AGC OUT | : AGC OUTPUT |
| CS OUT | : COLOR SEPARATION OUTPUT |
| IRIS OUT | : IRIS OUTPUT |
| DET OUT | : DET OUTPUT |
| VG OUT | : REGULATED DC OUTPUT |
| OP OUT | : OPERATIONAL AMPLIFIER OUTPUT |

| PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I | XSH1 | 13 | I | CLP 1 | 25 | I | DET LEVEL | 37 | I | PG IN |
| 2 | O | DC OUT | 14 | I | PBLK | 26 | I | AGC CLP | 38 | I | DATA IN |
| 3 | O | GY OUT | 15 | I | WND | 27 | O | AGC OUT | 39 | – | Vcc1 |
| 4 | O | F1 OUT | 16 | O | VG OUT | 28 | I | OP IN + | 40 | I | XSP3 |
| 5 | O | F2 OUT | 17 | O | IRIS OUT | 29 | I | OP IN – | 41 | I | XSP2 |
| 6 | O | F3 OUT | 18 | I | IRIS CLP | 30 | O | OP OUT | 42 | I | XSP1 |
| 7 | I | CS CLP | 19 | – | GND | 31 | I | AGC CONT | 43 | – | GND |
| 8 | I | CS CCD SL | 20 | I | DET CLP | 32 | I | AGC MAX | 44 | I | FSH1 |
| 9 | I | CS CCD GC | 21 | I | IRIS LEVEL | 33 | I | AGC SEL | 45 | I | F3 CLP |
| 10 | O | CS OUT | 22 | I | IRIS GC | 34 | I | XSHP | 46 | I | F2 CLP |
| 11 | I | CS AGC GC | 23 | – | Vcc2 | 35 | I | XSHD | 47 | I | F1 CLP |
| 12 | I | CS AGC SL | 24 | O | DET OUT | 36 | I | CLP4 | 48 | I | XSH2 |

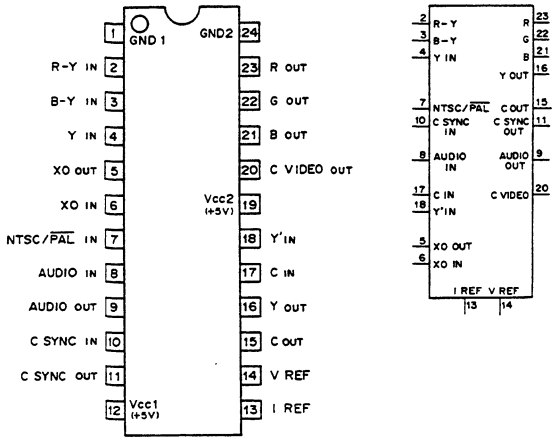



XC-999 (UCJ)
XC-999P (EK)
CMA-999 (UCJ)
CMA-999P (EK)

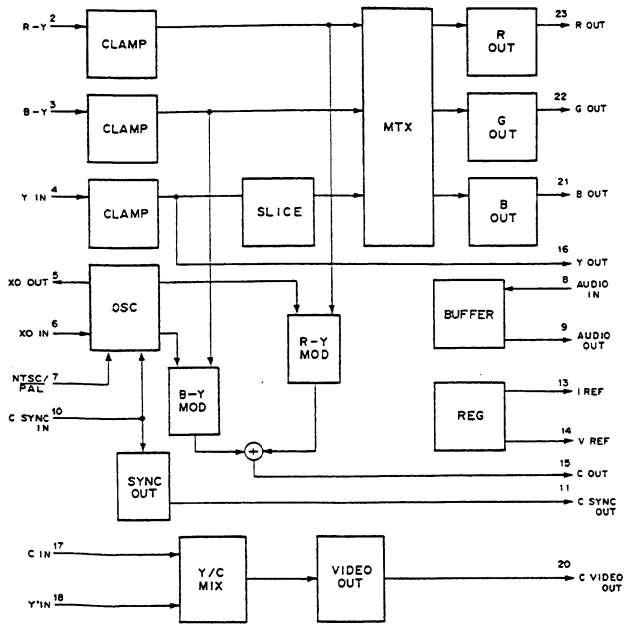
CXA1219M (SONY) FLAT PACKAGE

NTSC/PAL ENCODER

– TOP VIEW –



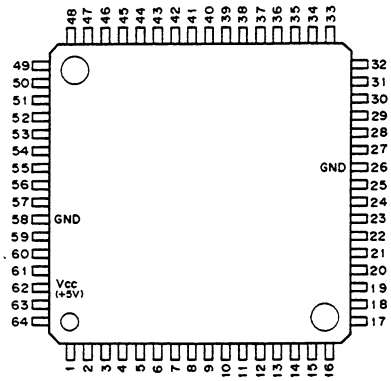

AUDIO ; AUDIO SIGNAL INPUT/OUTPUT
B ; ANALOG BLUE SIGNAL OUTPUT
B-Y ; B-Y SIGNAL INPUT
C ; CHROMA SIGNAL INPUT/OUTPUT
C SYNC ; COMPOSITE SYNC SIGNAL INPUT/OUTPUT
C VIDEO ; COMPOSITE VIDEO SIGNAL OUTPUT
G ; ANALOG GREEN SIGNAL OUTPUT
I REF ; REFERENCE CURRENT TERMINAL
NTSC/PAL ; NTSC/PAL SELECT INPUT
R ; ANALOG RED SIGNAL OUTPUT
R-Y ; R-Y SIGNAL INPUT
V REF ; REFERENCE VOLTAGE TERMINAL
XO ; CRYSTAL OSCILLATOR TERMINALS
Y ; Y SIGNAL INPUT/OUTPUT
Y' ; DEFERRED Y SIGNAL INPUT




CXA1391R (SONY) FLAT PACKAGE

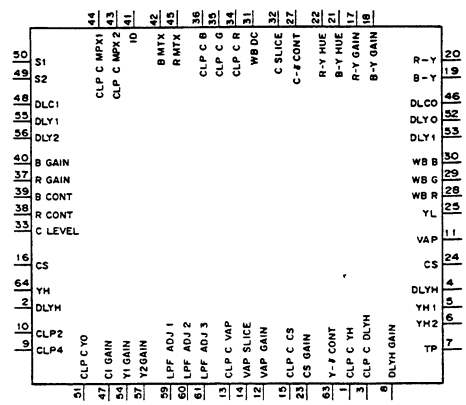
PROCESSING IC FOR COMPLEMENTARY COLOR MOSAIC CCD CAMERA

– TOP VIEW –




(Vcc = +5V)

| PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I | CLP C YH | 17 | I | R-Y GAIN | 33 | I | C LEVEL | 49 | I | S2 |
| 2 | I | DLYH | 18 | I | B-Y GAIN | 34 | I | CLP C R | 50 | I | S1 |
| 3 | I | CLP C DLYH | 19 | O | B-Y | 35 | I | CLP C G | 51 | I | CLP C YO |
| 4 | O | DLYH | 20 | O | R-Y | 36 | I | CLP C B | 52 | O | DLYO |
| 5 | O | YH1 | 21 | I | B-Y HUE | 37 | I | R GAIN | 53 | O | DLY1 |
| 6 | O | YH2 | 22 | I | R-Y HUE | 38 | I | R CONT | 54 | I | Y1 GAIN |
| 7 | O | TP | 23 | I | CS GAIN | 39 | I | B CONT | 55 | I | DLY1 |
| 8 | I | DLYH GAIN | 24 | O | CS | 40 | I | B GAIN | 56 | I | DLY2 |
| 9 | I | CLP4 | 25 | O | YL | 41 | I | ID | 57 | I | Y2 GAIN |
| 10 | I | CLP2 | 26 | – | GND | 42 | I | B MTX | 58 | – | GND |
| 11 | O | VAP | 27 | I | C-Y CONT | 43 | I | CLP C MPX2 | 59 | I | LPF ADJ 1 |
| 12 | I | VAP GAIN | 28 | O | WB R | 44 | I | CLP C MPX1 | 60 | I | LPF ADJ 2 |
| 13 | I | CLP C VAP | 29 | O | WB G | 45 | I | R MTX | 61 | I | LPF ADJ 3 |
| 14 | I | VAP SLICE | 30 | O | WB B | 46 | O | DLCO | 62 | – | Vcc |
| 15 | I | CLP C CS | 31 | O | WB DC | 47 | I | C1 GAIN | 63 | I | Y-Y CONT |
| 16 | I | CS | 32 | I | C SLICE | 48 | I | DLC1 | 64 | I | YH |

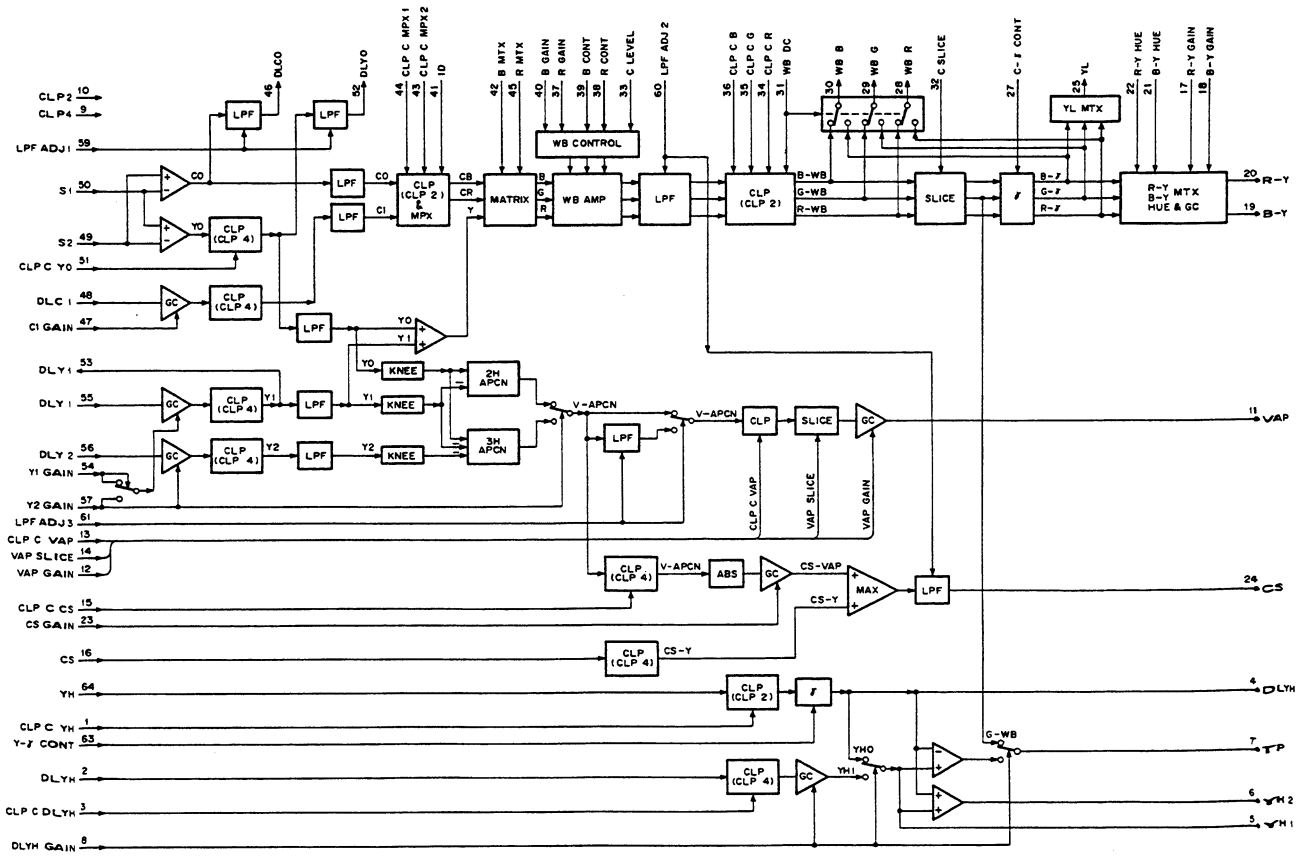


**INPUT**

| | |
|---|---|
| B, R CONT | : B, RCH WB AMPLIFIER GAIN CONTROL |
| B, R GAIN | : B, RCH WB AMPLIFIER GAIN CONTROL (PRE-WB) |
| B, R MTX | : B, R SIGNAL OPERATIONS MTX COEFFICIENT ADJ. |
| C LEVEL | : CHROMA (R.G.B) GAIN CONTROL |
| C SLICE | : CHROMA (R.G.B) SIGNALS DARK SLICE LEVEL ADJ. |
| C-γ CONT | : CHROMA (R.G.B) γ CURVE ADJ. |
| C1 GAIN | : DLC1 SIGNAL GAIN CONTROL |
| CLP C R.G.B | : CAPACITOR CONNECTING FOR R.G.B WB AMPLIFIER CLAMP |
| CLP C CS | : CAPACITOR CONNECTING FOR CS CLAMP |
| CLP C DLYH | : CAPACITOR CONNECTING FOR DLYH CLAMP |
| CLP C MPX1, 2 | : CAPACITOR CONNECTING FOR MPX CLAMP |
| CLP C VAP | : CAPACITOR CONNECTING FOR VAP CLAMP |
| CLP C YO | : CAPACITOR CONNECTING FOR YO CLAMP |
| CLP C YH | : CAPACITOR CONNECTING FOR YH CLAMP |
| CLP2 | : OPB CLAMP |
| CLP4 | : BLK CLAMP |
| CS IN | : AGC CS SIGNAL |
| CS GAIN | : V-APCN CS SIGNAL GAIN CONTROL |
| DLC1, Y1, Y2 | : DLC1, Y1, Y2 SIGNAL |
| DLYH | : DLYH SIGNAL |
| DLYH GAIN | : DLYH SIGNAL GAIN CONTROL |
| ID | : COLOR DISCRIMINATION PULSE |
| LPF ADJ 1 | : DETERMINES THE CHARACTERISTICS OF THE LPF FOR 1H DL |
| LPF ADJ 2 | : DETERMINES THE CHARACTERISTICS OF THE CHROMA LPF (R,G.B.CS ) |
| LPF ADJ 3 | : DETERMINES THE CHARACTERISTICS OF THE LPF FOR V-APCN |
| R-Y, B-Y GAIN | : R-Y, B-Y, SIGNAL OUTPUT LEVEL ADJ. |
| R-Y, B-Y HUE | : R-Y, B-Y HUE CONTROL |
| S1, 2 | : S1, 2 SIGNAL |
| VAP GAIN | : V-AFCN SIGNAL OUTPUT LEVEL ADJ. |
| VAP SLICE | : V-APCN SIGNAL DARK SLICE VOLUME ADJ. |
| Y-γ CONT | : YH γ CURVE ADJ. |
| Y1, 2 GAIN | : DLY1, 2 SIGNAL GAIN CONTROL |
| YH | : YH SIGNAL |

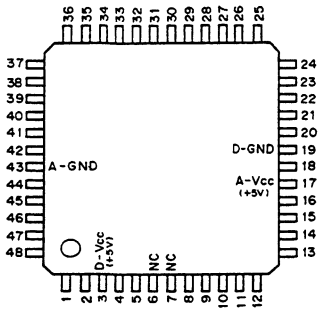
**OUTPUT**

| | |
|---|---|
| CS OUT | : CS SIGNAL |
| DLCO | : DLCO SIGNAL |
| DLCO, 1 | : DLCO, 1 SIGNAL |
| DLYO,1 | : DLYO, 1 SIGNAL |
| DLYH | : DLYH SIGNAL |
| R-Y, B-Y | : R-Y, B-Y SIGNAL |
| TP | : ADJUSTING PIN |
| VAP | : V-APCN SIGNAL |
| WB R.G.B | : R.G.B SIGNAL |
| WB DC | : AUTO WB DC OUTPUT OR WB R.G.B TURN TO γ MODE |
| YH1, 2 | : YH1, 2 SIGNAL |
| YL | : YL SIGNAL |



CXA1392R (SONY) FLAT PACKAGE

ENCODER FOR CCD COLOR CAMERA
– TOP VIEW –



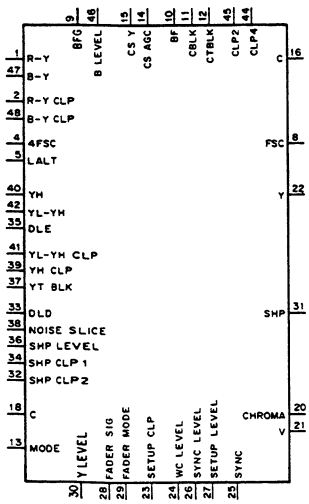

| PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL | PIN No. | I/O | SYMBOL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I | R-Y | 13 | I | MODE | 25 | I | SYNC | 37 | I | YTBLK |
| 2 | I | R-Y CLP | 14 | I | CS AGC | 26 | I | SYNC LEVEL | 38 | I | NOISE SLICE |
| 3 | – | D-Vcc(+5V) | 15 | I | CSY | 27 | I | SETUP LEVEL | 39 | I | YH CLP |
| 4 | I | 4FSC | 16 | O | C | 28 | I | FADER SIG | 40 | I | YH |
| 5 | I | LALT | 17 | – | A-Vcc(+5V) | 29 | I | FADER MODE | 41 | I | YL-YH CLP |
| 6 | – | NC | 18 | I | C | 30 | I | Y LEVEL | 42 | I | YL-YH |
| 7 | – | NC | 19 | – | D-GND | 31 | O | SHP | 43 | – | A-GND |
| 8 | O | FSC | 20 | O | CHROMA | 32 | I | SHP CLP2 | 44 | I | CLP4 |
| 9 | I | BFG | 21 | O | V | 33 | I | DLD | 45 | I | CLP2 |
| 10 | I | BF | 22 | O | Y | 34 | I | SHP CLP1 | 46 | I | B LEVEL |
| 11 | I | CBLK | 23 | I | SETUP CLP | 35 | I | DLE | 47 | I | B-Y |
| 12 | I | CTBLK | 24 | I | WC LEVEL | 36 | I | SHP LEVEL | 48 | I | B-Y CLP |

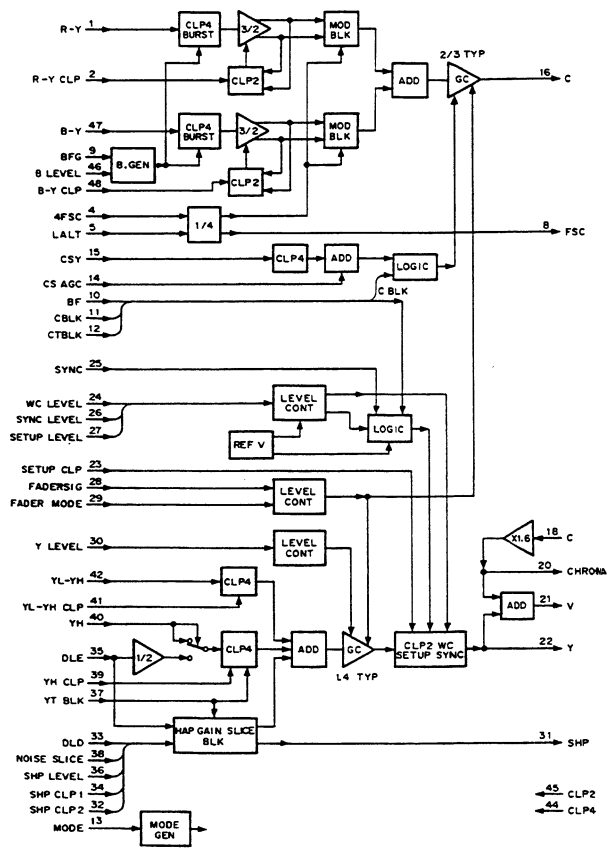
**INPUT**

| | |
|---|---|
| 4FSC | : 4FSC USED TO MAKE UP THE SUB CARRIER |
| B LEVEL | : CONTROLS THE BURST LEVEL |
| BF | : BURST FLAG PULSE |
| BFG | : INSERTS PULSE SLIGHT LARGER THAN BF ON BOTH ENDS |
| C | : INPUT FOR CHROMA SIGNAL PASSED THROUGH BPF |
| CBLK | : COMPOSITE BLANKING PULSE |
| CLP2, 4 | : CLAMP2, 4 PULSE INPUT |
| CS AGC | : SUPPRESS CHROMA SIGNAL AT THE AGC GAIN CONTROL SIGNAL |
| CSY | : SUPPRESS CHROMA SIGNAL AT THE Y SIGNAL |
| CTBLK | : CHROMA TITLER PULSE |
| DLD | : CONNECTS THE DELAY LINE DRIVE SIDE OF THE APERTURE SIGNAL |
| DLE | : CONNECTS THE DELAY LINE END SIDE OF THE APERTURE SIGNAL |
| FADER MODE | : BLACK FADER AND WHITE FADER MODE SELECT |
| FADER SIG | : CONTROLS THE SIGNAL SUPPRESS LEVEL DURING BLACK FADER, CONTROLS THE SIGNAL SUPPRESS LEVEL DURING WHITE FADER AND AT THE SAME TIME CONTROLS THE SET UP LEVEL |
| LALT | : INPUT FOR LINE ALTERNATE SIGNAL DURING PAL MODE |
| MODE | : SELECTS NTSC, PAL OR NTSC×2, PAL×2 MODES |
| NOISE SLICE | : CONTROLS THE SLICE LEVEL OF THE APERTURE SIGNAL |
| R-Y, B-Y | : R-Y, B-Y SIGNAL |
| R-Y, B-Y CLP | : CONNECTING THE CAPACITOR FOR R-Y, B-Y MODULATOR CLAMP |
| SETUP CLP | : CONNECTING FOR THE WHITE CLIP CLAMP CAPACITOR |
| SETUP LEVEL | : SET UP LEVEL CONTROL |
| SHP CLP1, 2 | : CONNECTS THE CLAMP CAPACITOR USED FOR THE SLICE OF THE APERTURE SIGNAL |
| SHP LEVEL | : CONTROL OF THE APERTURE SIGNAL LEVEL |
| SYNC | : SYNC PULSE |
| SYNC LEVEL | : SYNC LEVEL CONTROL |
| WC LEVEL | : WHITE CLIP LEVEL CONTROL |
| Y LEVEL | : Y SIGNAL LEVEL CONTROL |
| YH | : YH SIGNAL |
| YH CLP | : CONNECTS THE CAPACITOR FOR YH INPUT CLAMP |
| YL-YH | : V APERTURE SIGNALS, TITLER SIGNALS AND YL-YH SIGNALS |
| YL-YH CLP | : CONNECTS THE CAPACITOR FOR YL-YH INPUT CLAMP |
| YTBLK | : Y TITLER PULSE |

**OUTPUT**

| | |
|---|---|
| C | : CHROMA SIGNAL OUTPUT |
| CHROMA | : CHROMA SIGNAL OUTPUT WHEN USED FOR Y/C SEPARATION OUTPUT |
| FSC | : OUTPUTS A SUB CARRIER WITH THE SAME PHASE AS B-Y |
| SHP | : APERTURE SIGNAL |
| V | : COMPOSITE VIDEO SIGNAL |
| Y | : Y SIGNAL OUTPUT WHEN USED FOR Y/C SEPARATION OUTPUT |



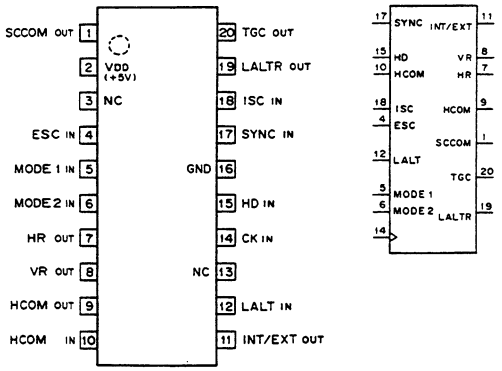



XC-999 (UCJ)
XC-999P (EK)
CMA-999 (UCJ)
CMA-999P (EK)

CXD1216M (SONY) FLAT PACKAGE

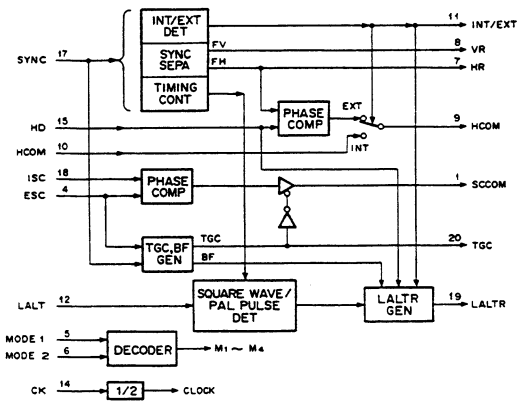
C-MOS GENLOCK DRIVER

– TOP VIEW –




| INPUT | | MODE | SYSTEM |
|---|---|---|---|
| MODE 1 | MODE 2 | | |
| 0 | 0 | M1 | PAL-VBS |
| 1 | 0 | M2 | PALM-VBS |
| 0 | 1 | M3 | PAL,SECAM-VS/SC/LALT |
| 1 | 1 | M4 | NTSC-VBS,NTSC-VS/SC PALM-VS/SC/LALT |

0 : LOW LEVEL
1 : HIGH LEVEL




**INPUT**

| | |
|---|---|
| CK | ; 4fsc CLOCK INPUT |
| ESC | ; SC/COLOR BURST |
| HCOM | ; PHASE COMPARATE FROM CXD1217 |
| HD | ; H DRIVE FROM CXD1217 |
| ISC | ; SUBCARRIER FROM CXD1217 |
| LALT | ; LALT FROM REFERENCE SIGNAL GENERATOR |
| MODE1,2 | ; SYSTEM SELECT |
| SYNC | ; SYNC FROM REFERENCE SIGNAL GENERATOR |

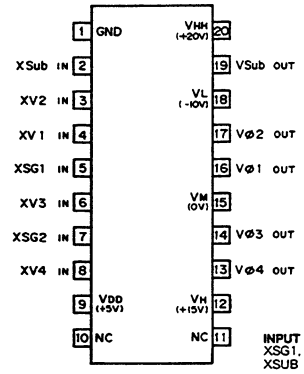
**OUTPUT**

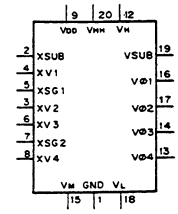
| | |
|---|---|
| HCOM | ; PHASE COMPARATOR HR WITH HD |
| HR | ; fh OF SYNC SEPARATE |
| INT/EXT | ; INTERNAL/EXTERNAL SPECIFIED |
| LALTR | ; LINE CHANGE RESET |
| SCCOM | ; PHASE COMPARATOR ESC WITH ISC |
| TGC | ; TRISTATE CONTROL |
| VR | ; fv OF SYNC SEPARATE |

CXD1250N (SONY) FLAT PACKAGE

C-MOS VERTICAL CLOCK DRIVER FOR CCD

– TOP VIEW –



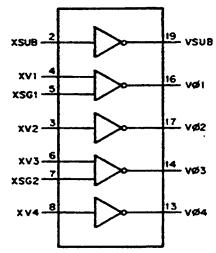




**INPUT**

| | |
|---|---|
| XSG1, XSG2 | ; SENSOR GATE PULSE INPUT |
| XSUB | ; CCD ELECTRIC CHARGE SWEEPING AWAY PULSE INPUT |
| XV1-XV4 | ; VERTICAL REGISTER TRANSMISSION CLOCK INPUT |

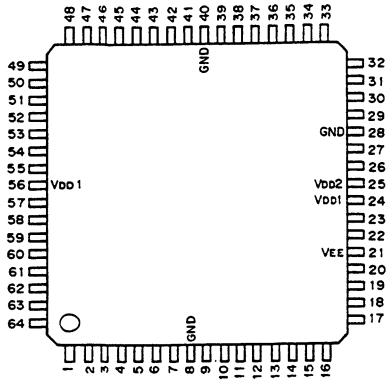
**OUTPUT**

| | |
|---|---|
| VSUB | ; CCD ELECTRIC CHARGE SWEEPING AWAY PULSE OUTPUT |
| V φ 1-V φ 4 | ; VERTICAL REGISTER TRANSMISSION CLOCK OUTPUT |

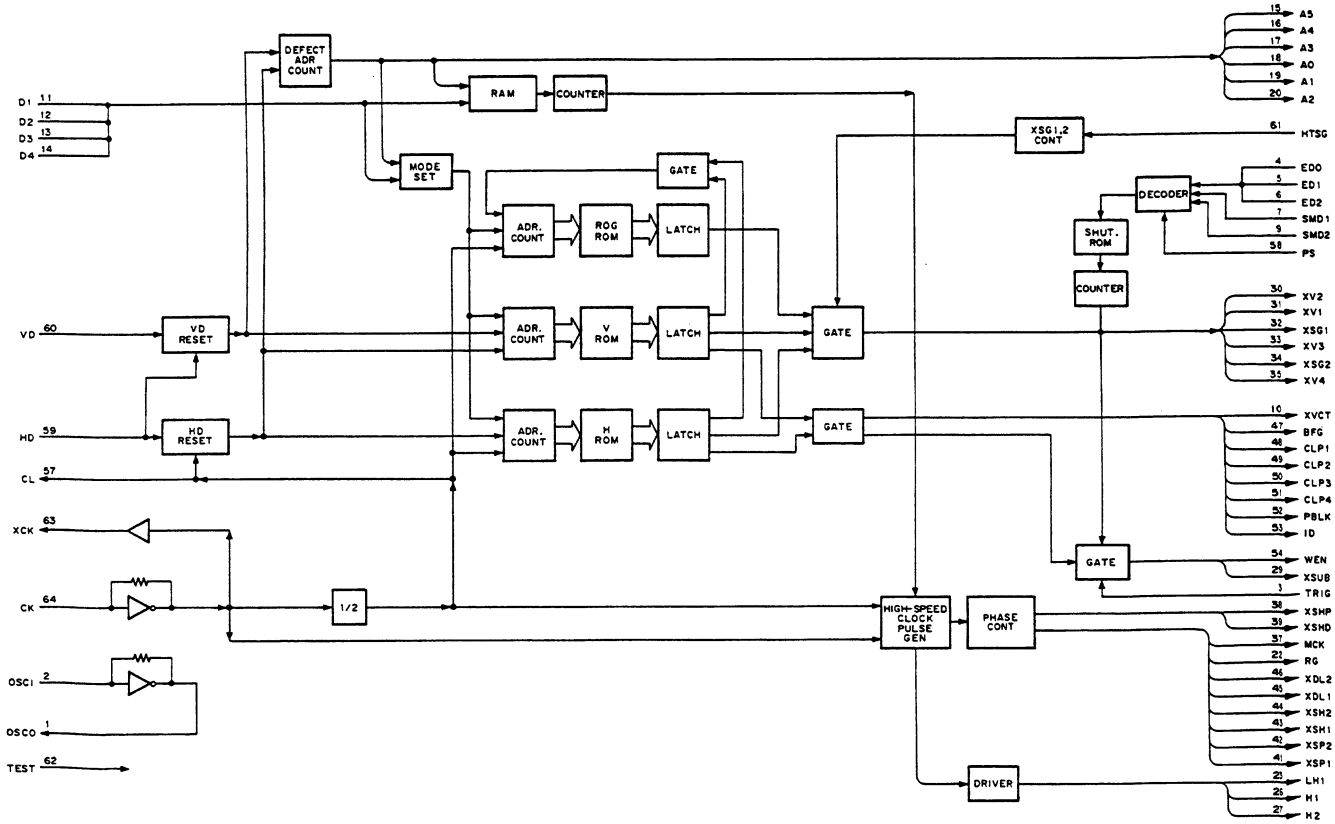


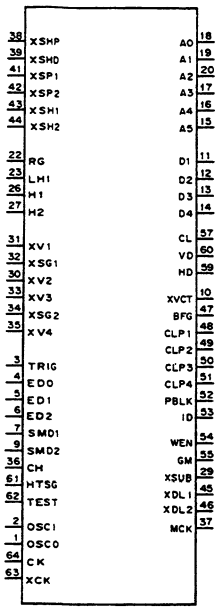
CXD1252AR (SONY)

C-MOS TIMING PULSE GENERATOR FOR CCD
– TOP VIEW –




| PIN NO. | I/O | SYMBOL | PIN NO. | I/O | SYMBOL | PIN NO. | I/O | SYMBOL | PIN NO. | I/O | SYMBOL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | O | OSCO | 17 | O | A3 | 33 | O | XV3 | 49 | O | CLP2 |
| 2 | I | OSCI | 18 | O | A0 | 34 | O | XSG2 | 50 | O | CLP3 |
| 3 | I | TRIG | 19 | O | A1 | 35 | O | XV4 | 51 | O | CLP4 |
| 4 | I | ED0 | 20 | O | A2 | 36 | I | CH | 52 | O | PBLK |
| 5 | I | ED1 | 21 | – | VEE | 37 | O | MCK | 53 | O | ID |
| 6 | I | ED2 | 22 | O | RG | 38 | O | XSHP | 54 | O | WEN |
| 7 | I | SMD1 | 23 | O | LH1 | 39 | O | XSHD | 55 | I | GM |
| 8 | – | GND | 24 | – | VDD1 | 40 | – | GND | 56 | – | VDD1 |
| 9 | I | SMD2 | 25 | – | VDD2 | 41 | O | XSP1 | 57 | O | CL |
| 10 | O | XVCT | 26 | O | H1 | 42 | O | XSP2 | 58 | I | PS |
| 11 | I | D1 | 27 | O | H2 | 43 | O | XSH1 | 59 | I | HD |
| 12 | I | D2 | 28 | – | GND | 44 | O | XSH2 | 60 | I | VD |
| 13 | I | D3 | 29 | O | XSUB | 45 | O | XDL1 | 61 | I | HTSG |
| 14 | I | D4 | 30 | O | XV2 | 46 | O | XDL2 | 62 | I | TEST |
| 15 | O | A5 | 31 | O | XV1 | 47 | O | BFG | 63 | O | XCK |
| 16 | O | A4 | 32 | O | XSG1 | 48 | O | CLP1 | 64 | I | CK |

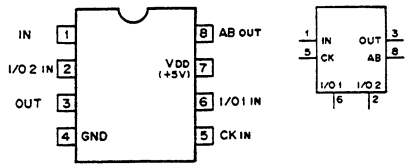




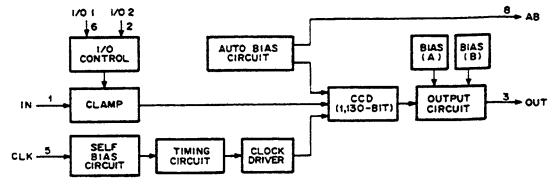

CXL5504M (SONY)

C-MOS CCD 1H DELAY LINE

– TOP VIEW –




AB ; AUTO BIAS DC OUTPUT
CK ; CLOCK INPUT
IN ; SIGNAL INPUT
I/O1, I/O2 ; I/O CONTROL 1,2 INPUTS
OUT ; SIGNAL OUTPUT




**INPUT**

| | |
|---|---|
| CH | ; MOSAIC/STRIPE COLOR CODING (L ; MOSAIC) SELECT SIGNAL |
| CK | ; MAIN CLOCK PULSE |
| D1-D4 | ; DATA INPUT FOR EXTERNAL ROM |
| ED0-ED2 | ; SHUTTER SPEED CONTROL PULSE |
| GM | ; NORMAL/G3 SELECT SIGNAL (L ; NORMAL, H ; G3) |
| HD | ; HORIZONTAL DRIVE PULSE |
| HTSG | ; XSG1, XSG2 CONTROL PULSE (L ; STOP, H ; GENERATE) |
| OSCI | ; INVERTER INPUT FOR OSCILLATOR |
| SMD1, SMD2 | ; SHUTTER MODE SET SIGNAL |
| TEST | ; TEST SIGNAL (H ; TEST MODE) |
| TRIG | ; CONTINUOUS VARIABLE SHUTTER CONTROL PULSE |
| VD | ; VERTICAL DRIVE PULSE |

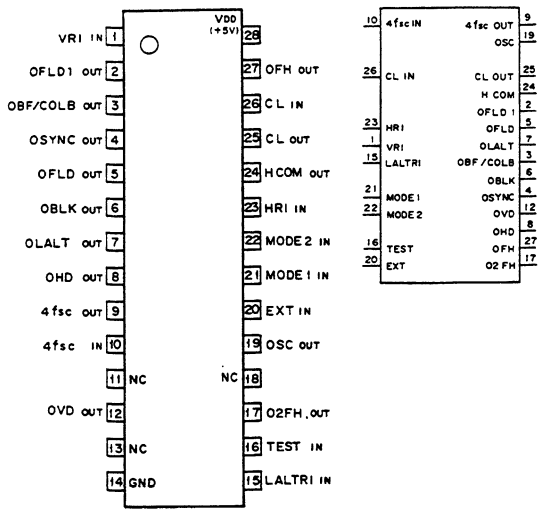
**OUTPUT**

| | |
|---|---|
| A0-A5 | ; ADDRESS OUTPUT FOR EXTERNAL ROM |
| BFG | ; ENCODER/CHROMA MODULATOR PULSE |
| CL | ; 1/2 CK PULSE |
| CLP1-CLP4 | ; CLAMP PULSE |
| H1, H2 | ; CLOCK PULSE FOR DRIVING HORIZONTAL REGISTER |
| ID | ; LINE DISCRIMINATE PULSE (MOSAIC MODE) : L (STRIPE MODE) |
| LH1 | ; CLOCK PULSE FOR DRIVING CCD HORIZONTAL FINAL REGISTER |
| MCK | ; CLOCK PULSE FOR G3 |
| OSCO | ; INVERTER OUTPUT FOR OSCILLATOR |
| PBLK | ; BLANKING CLEANING PULSE |
| RG | ; RESET GATE PULSE |
| WEN | ; WRITE ENABLE PULSE (ONLY LOW SPEED SHUTTER MODE) |
| XCK | ; INVERTED CK PULSE |
| XDL1, XDL2 | ; DELAY LINE CLOCK (MOSAIC MODE) /CHROMA SEPARATE S/H PULSE (STRIPE) |
| XSG1, XSG2 | ; CCD SENSOR ELECTRIC CHARGE READ OUT PULSE |
| XSH1, XSH2 | ; SELECT S/H PULSE |
| XSHD | ; DATA S/H PULSE |
| XSHP | ; PRE CHARGE S/H PULSE |
| XSP1, XSP2 | ; CHROMA SEPARATE S/H PULSE |
| XSUB | ; CCD ELECTRIC CHARGE SWEEPING AWAY PULSE |
| XV1-XV4 | ; CLOCK PULSE FOR DRIVING CCD VERTICAL REGISTER |
| XVCT | ; POW |

CXD1217M (SONY) FLAT PACKAGE

C-MOS SYNC GENERATOR

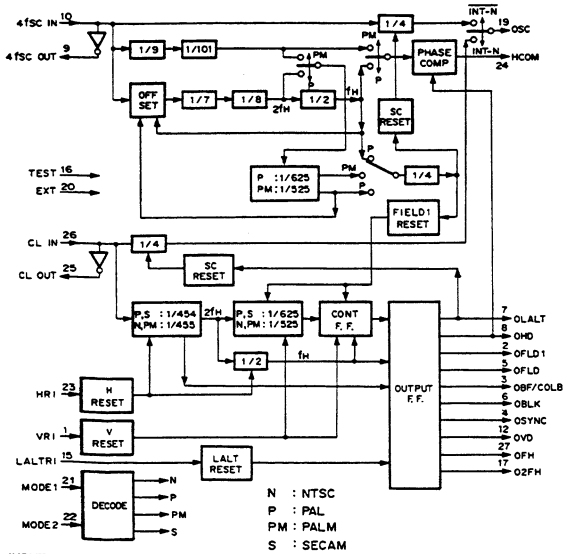
- TOP VIEW -




| SYSTEM | 4fsc | CLOCK |
|---|---|---|
| NTSC | 910fH | 910fH |
| PAL | 1135fH+2fV | 908fH |
| PALM | 909fH | 910fH |
| SECAM | — | 908fH |

| INPUT | | SYSTEM |
|---|---|---|
| MODE1 | MODE2 | |
| 0 | 0 | NTSC |
| 0 | 1 | SECAM |
| 1 | 0 | PALM |
| 1 | 1 | PAL |

0 ; LOW LEVEL
1 ; HIGH LEVEL



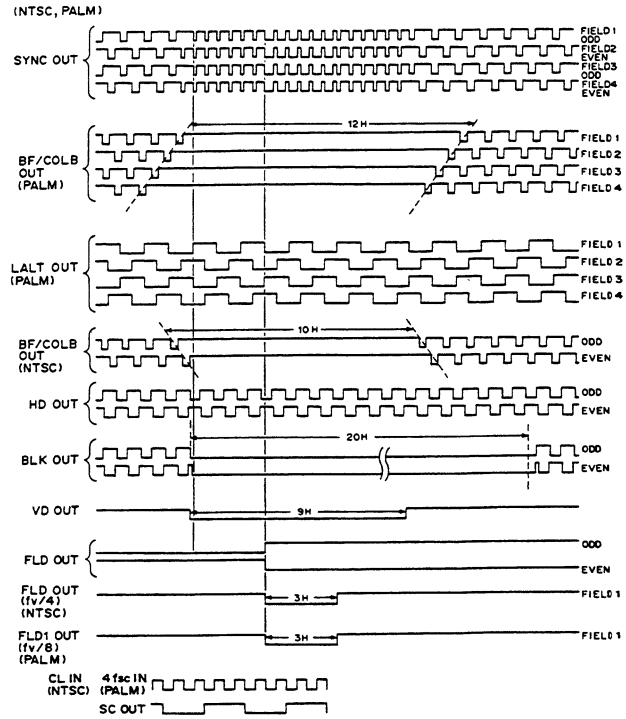

**INPUT**

| | |
|---|---|
| 4fSC IN | : 4fSC INPUT |
| CL IN | : CLOCK INPUT |
| EXT | : SYNC MODE SELECT (L ; INTERNAL/H ; EXTERNAL) |
| HRI | : H RESET |
| LALTRI | : LINE CHANGE RESET |
| MODE 1,2 | : SYSTEM SELECT |
| VRI | : V RESET |

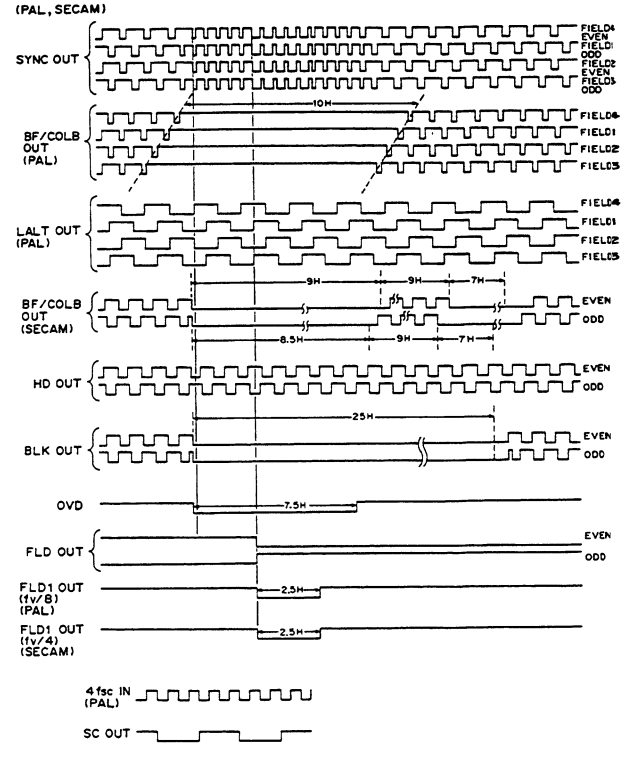
**OUT PUT**

| | |
|---|---|
| 4fSC OUT | : 4fSC OUTPUT |
| CL OUT | : CLOCK OUTPUT |
| HCOM | : PHASE COMPARATOR |
| 02fH | : 2fH OUTPUT |
| OBF/COLB | : BURST FLAG/COLOR BLANKING |
| OBLK | : COMPOSITE BLANKING |
| OFH | : H FREQUENCE |
| OFLD | : EVEN, ODD |
| OFLD1 | : FIELD1 |
| OHD | : H DRIVE |
| OLALT | : LINE CHANGE |
| OSC | : SUBCARRIER |
| OSYNC | : COMPOSITE SYNC |
| OVD | : V DRIVE |

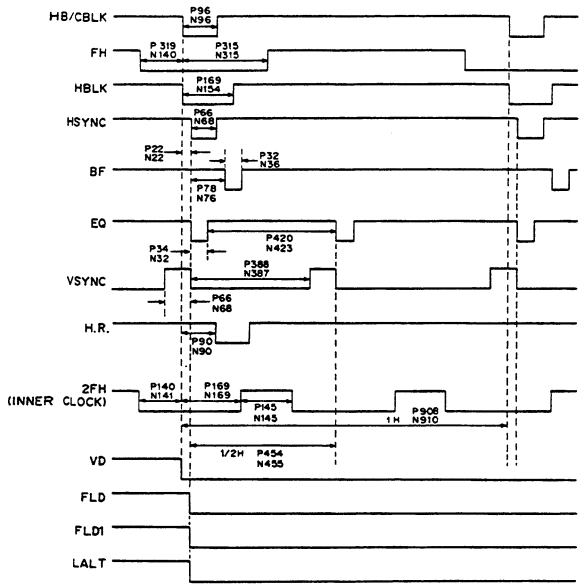
(NTSC, PALM)




(PAL, SECAM)



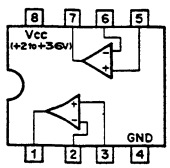

XC-999 (UCJ)
XC-999P (EK)
CMA-999 (UCJ)
CMA-999P (EK)




P: PAL, SECAM
N: NTSC, PALM

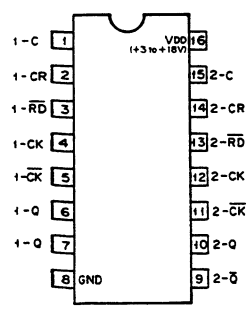
LM2903M (RAYTHEON) FLAT PACKAGE

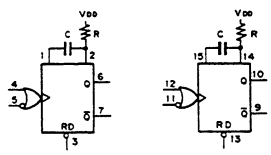
DUAL VOLTAGE COMPARATORS
– TOP VIEW –




MC14538BF (MOTOROLA) FLAT PACKAGE

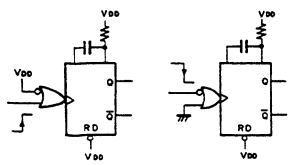
C-MOS DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS
– TOP VIEW –



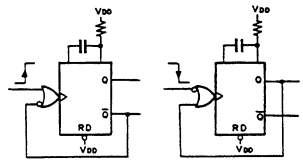




OUTPUT PULSE WIDTH = C·R

RETRIGGERABLE M.M.V

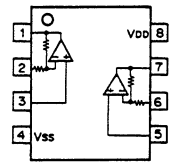



NON-RETRIGGERABLE M.M.V




MC14576AF (MOTOROLA) FLAT PACKAGE

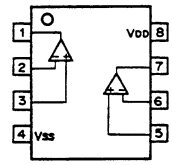
C-MOS DUAL VIDEO AMPLIFIERS
– TOP VIEW –




|VDD| + |VSS| = +5V to +12V

MC14577AF (MOTOROLA) FLAT PACKAGE

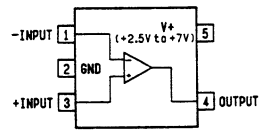
C-MOS DUAL VIDEO AMPLIFIERS
– TOP VIEW –




|VDD| + |VSS| = +5V to +12V

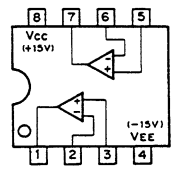
NJM2406F (JRC) FLAT PACKAGE

SINGLE COMPARATOR
– TOP VIEW –




NJU7022M (JRC) FLAT PACKAGE

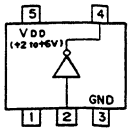
DUAL OPERATIONAL AMPLIFIER
– TOP VIEW –

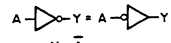



XC-999 (UCJ)
XC-999P (EK)
CMA-999 (UCJ)
CMA-999P (EK)

SC7S04F (MOTOROLA) FLAT PACKAGE
TC7S04F (TOSHIBA) FLAT PACKAGE
TC7SU04F (TOSHIBA) FLAT PACKAGE

C-MOS INVERTER
– TOP VIEW –



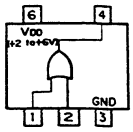



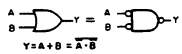

| A | Y |
|---|---|
| 0 | 1 |
| 1 | 0 |

0; LOW LEVEL
1; HIGH LEVEL

SC7S32F (MOTOROLA) FLAT PACKAGE
TC7S32F (TOSHIBA) FLAT PACKAGE

C-MOS 2-INPUT OR GATE
– TOP VIEW –



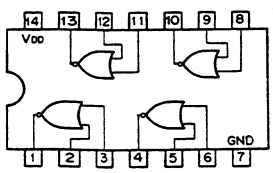



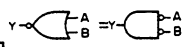

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

0 ; LOW LEVEL
1 ; HIGH LEVEL

SN74HC02ANS (TI) FLAT PACKAGE
TC74HC02AF (TOSHIBA) FLAT PACKAGE

C-MOS QUAD 2-INPUT NOR GATES
– TOP VIEW –




| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 0 |

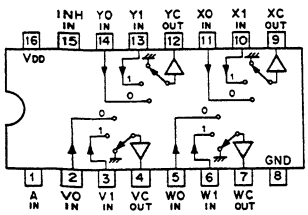
0:LOW LEVEL
1:HIGH LEVEL

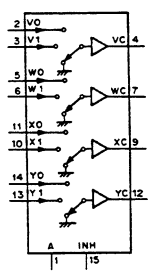
NOTE :

| TYPE | VDD |
|---|---|
| TC74AC02F | +2 to +5.5V |
| 74ACT02SJ | +4.5 to +5.5V |
| OTHER TYPES | +2 to +6V |

µPD74HC157G (NEC) FLAT PACKAGE

C-MOS QUAD 2-LINE-TO-1-LINE DATA SELECTOR/MULTIPLEXER
– TOP VIEW –




NOTE :

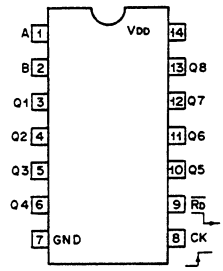
| TYPE | VDD |
|---|---|
| 74ACT157 | +5V |
| TC74AC157P<br>TC74AC157F | +2 to +5.5V |
| OTHER TYPES | +2 to +6V |

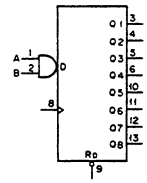
| CONT. IN | | ON CHANNEL |
|---|---|---|
| INH | A | |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | X | GND |

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

µPD74HC164G (NEC) FLAT PACKAGE
SN74HC164NS (TI) FLAT PACKAGE
TC74HC164AF (TOSHIBA) FLAT PACKAGE

C-MOS 8-BIT SERIAL-IN/PARALLEL-OUT SHIFT REGISTER
– TOP VIEW –



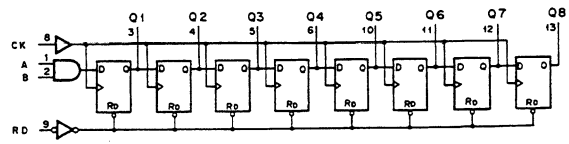




| INPUTS | | | | OUTPUTS | | | |
|---|---|---|---|---|---|---|---|
| RD | CK | A | B | Q1 | Q2 | ---- | Q8 |
| 0 | X | X | X | 0 | 0 | 0 | 0 |
| 1 | 0 | X | X | Q1o | Q2o | ---- | Q8o |
| 1 | ↑ | 1 | 1 | 1 | Q1n | ---- | Q7n |
| 1 | ↑ | 0 | X | 0 | Q1n | ---- | Q7n |
| 1 | ↑ | X | 0 | 0 | Q1n | ---- | Q7n |

0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE

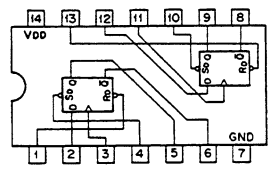
NOTE :

| TYPE | VDD |
|---|---|
| TC74AC164F | +2 to +5.5V |
| OTHER TYPES | +2 to +6V |



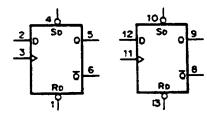

µPD74HC74G (NEC) FLAT PACKAGE

C-MOS DUAL D-TYPE FLIP-FLOPS WITH DIRECT SET/RESET
– TOP VIEW –




| INPUTS | | | | OUTPUTS | |
|---|---|---|---|---|---|
| S̄D | R̄D | CK | D | Qn+1 | Q̄n+1 |
| 0 | 1 | X | X | 1 | 0 |
| 1 | 0 | X | X | 0 | 1 |
| 0 | 0 | X | X | 1 | 1 |
| 1 | 1 | ↑ | 1 | 1 | 0 |
| 1 | 1 | ↑ | 0 | 0 | 1 |
| 1 | 1 | 0 | X | Qn | Q̄n |

0;LOW LEVEL
1;HIGH LEVEL
X;DON'T CARE

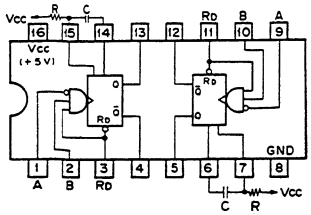



NOTE :

| TYPE | VDD |
|---|---|
| TC74HCT74AF | +5V |
| TC74AC74 TYPE | +2 to +5.5V |
| 74ACT74 TYPE | +4.5 to +5.5V |
| OTHER TYPES | +2 to +6V |

SN74LS123NS (TI) FLAT PACKAGE

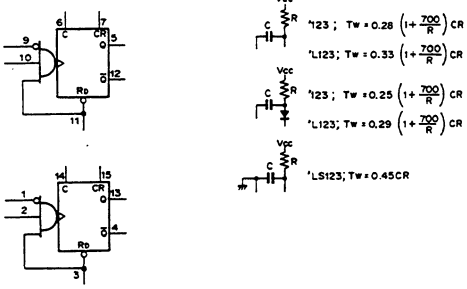
TTL RETRIGGERABLE MONOSTABLE MULTIVIBRATOR WITH DIRECT RESET
– TOP VIEW –




| INPUTS | | | OUTPUTS | |
|---|---|---|---|---|
| Rd | A | B | Q | $\bar{Q}$ |
| 0 | X | X | 0 | 1 |
| X | 1 | X | 0 | 1 |
| X | X | 0 | 0 | 1 |
| 1 | 0 | ↑ | ⊓ | ⊔ |
| 1 | ↓ | 1 | ⊓ | ⊔ |
| ↑ | 0 | 1 | ⊓ | ⊔ |

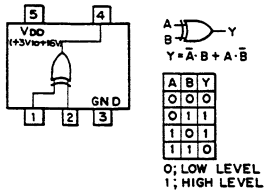
0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

OUTPUT PULSE WIDTH




TC4S30F (TOSHIBA) FLAT PACKAGE

C-MOS EXCLUSIVE OR GATE
– TOP VIEW –

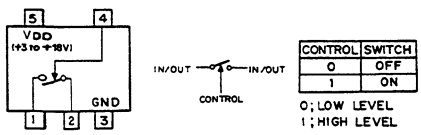



| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

0; LOW LEVEL
1; HIGH LEVEL

TC4S66F (TOSHIBA)

C-MOS BILATERAL ANALOG SWITCH
– TOP VIEW –

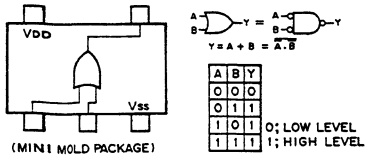



| CONTROL | SWITCH |
|---|---|
| 0 | OFF |
| 1 | ON |

0; LOW LEVEL
1; HIGH LEVEL

TC4S71F (TOSHIBA) FLAT PACKAGE

C-MOS 2-INPUT OR GATE
– TOP VIEW –



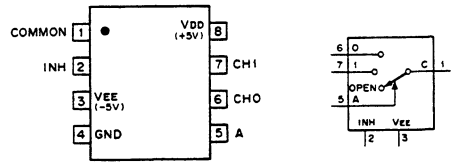

(MINI MOLD PACKAGE)

| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 1 |

0; LOW LEVEL
1; HIGH LEVEL

TC4W53F (TOSHIBA) FLAT PACKAGE

C-MOS 2-CHANNEL MULTIPLEXER/DEMULTIPLEXER
– TOP VIEW –

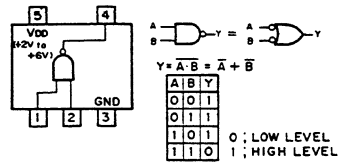



| CONT. INPUT | | ON CHANNEL |
|---|---|---|
| INH | A | |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | X | OPEN |

0; LOW LEVEL
1; HIGH LEVEL
X; DON'T CARE

TC7S00F (TOSHIBA) FLAT PACKAGE

C-MOS 2-INPUT NAND GATE
– TOP VIEW –

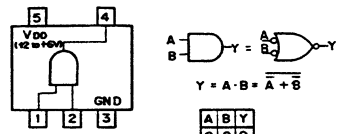



| A | B | Y |
|---|---|---|
| 0 | 0 | 1 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

0; LOW LEVEL
1; HIGH LEVEL

TC7S08F (TOSHIBA) FLAT PACKAGE

C-MOS 2-INPUT AND GATE
– TOP VIEW –

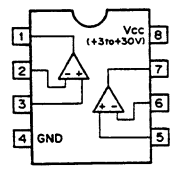



| A | B | Y |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 0 |
| 1 | 0 | 0 |
| 1 | 1 | 1 |

0; LOW LEVEL
1; HIGH LEVEL

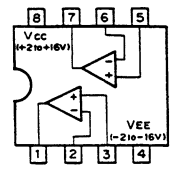
UPC358G2 (NEC) FLAT PACKAGE

DUAL OPERATIONAL AMPLIFIERS
– TOP VIEW –



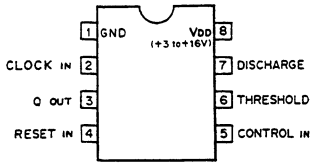

UPC4062G2 (NEC) FLAT PACKAGE

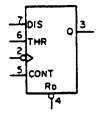
TTL-DUAL OPERATIONAL AMPLIFIER WITH LOW POWER CONSUMPTION
– TOP VIEW –



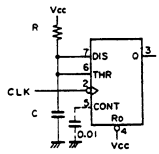
UPD5555G (NEC) FLAT PACKAGE

C-MOS PRECISION TIMER
– TOP VIEW –



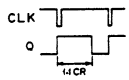




MONOSTABLE MULTIVIBRATOR

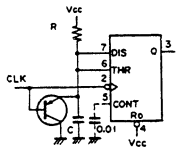



| INPUTS | | OUT |
|---|---|---|
| RD | CLK | Q |
| 0 | X | 0 |
| 1 | ⊓ | ⊓ |

0 , LOW LEVEL
1 , HIGH LEVEL
X , DON'T CARE

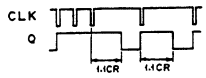



RETRIGGERABLE MONO. MULTIVIBRATOR
(MISSING PULSE DETECTOR)

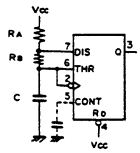



| INPUTS | | OUT |
|---|---|---|
| RD | CLK | Q |
| 0 | X | 0 |
| 1 | ⊓ | ⊓ |

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE

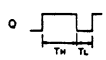



ASTABLE MULTIVIBRATOR



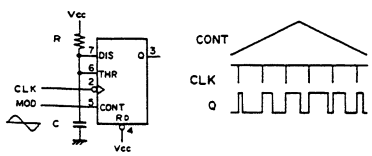

| RD | Q |
|---|---|
| 0 | 0 |
| 1 | ⊓ |

0 ; LOW LEVEL
1 ; HIGH LEVEL

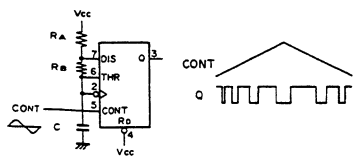



$T_H = 0.693C\,(R_A + R_B)$
$T_L = 0.693C\,R_B$

PULSE WIDTH MODULATOR

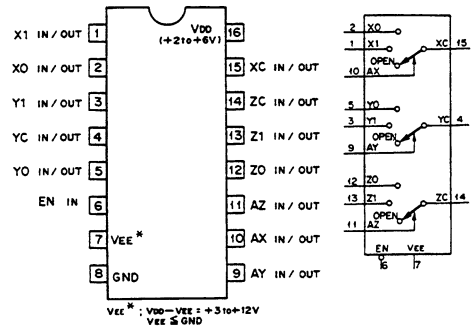



VCO
(PULSE POSITION MODULATOR)




UPD74HC4053G (NEC) FLAT PACKAGE

C-MOS TRIPLE 2-CHANNEL ANALOG MULTIPLEXER/DEMULTIPLEXER
– TOP VIEW –



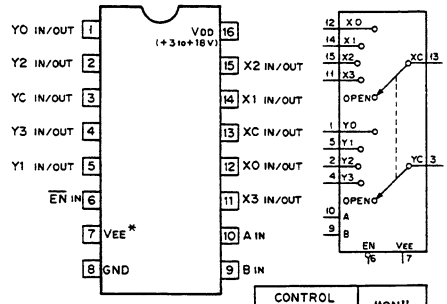

VEE* ; VDD – VEE = +3 to +12V
VEE ≦ GND

| CONT. INPUTS | | ON |
|---|---|---|
| EN | A (X,Y,Z) | CHANNEL |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | X | OPEN |

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE.

XRU4052BF (EXA) FLAT PACKAGE

C-MOS DUAL 4-CHANNEL ANALOG MULTIPLEXERS/DEMULTIPLEXERS
– TOP VIEW –



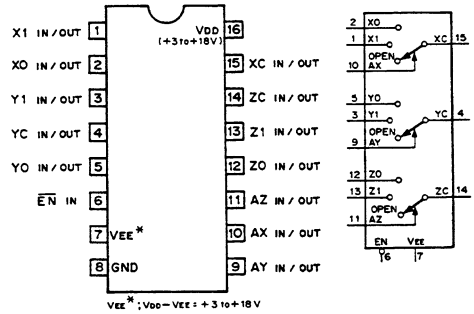

VEE* ; VDD – VEE = +3 to +18V

| CONTROL INPUTS | | | "ON" CHANNEL |
|---|---|---|---|
| EN | B | A | |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 2 |
| 0 | 1 | 1 | 3 |
| 1 | X | X | OPEN |

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE.

HD14053BFP (HITACHI) FLAT PACKAGE

C-MOS TRIPLE 2-CHANNEL ANALOG MULTIPLEXERS/DEMULTIPLEXERS
– TOP VIEW –




VEE* ; VDD – VEE = +3 to +18V

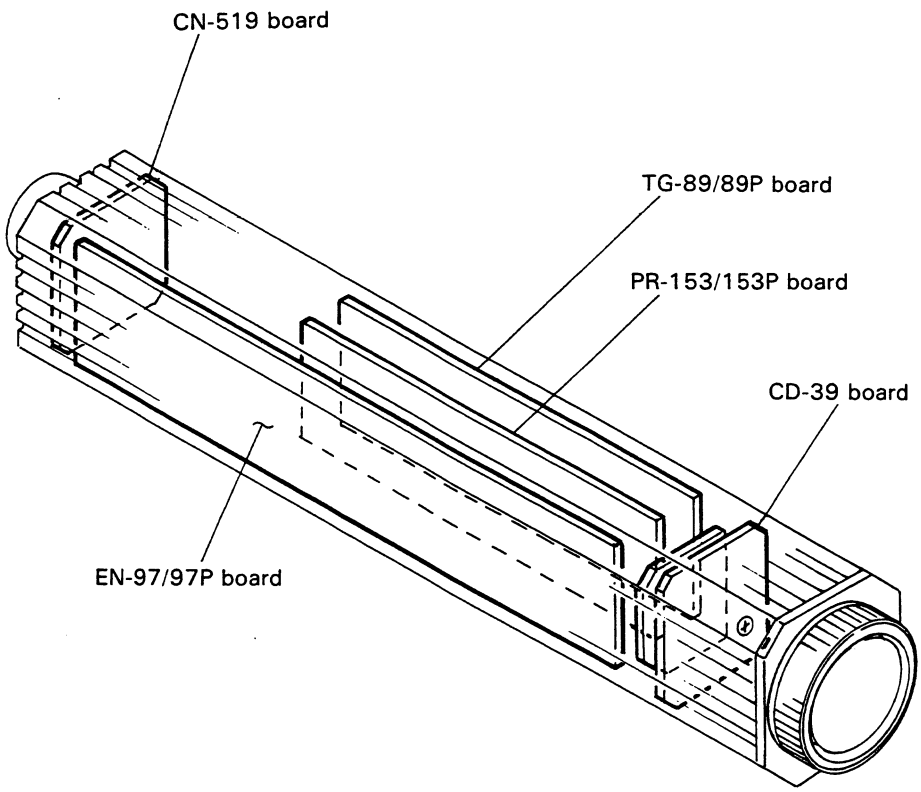
| CONT. INPUTS | | ON |
|---|---|---|
| EN | A (X,Y,Z) | CHANNEL |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | X | OPEN |

0 ; LOW LEVEL
1 ; HIGH LEVEL
X ; DON'T CARE.

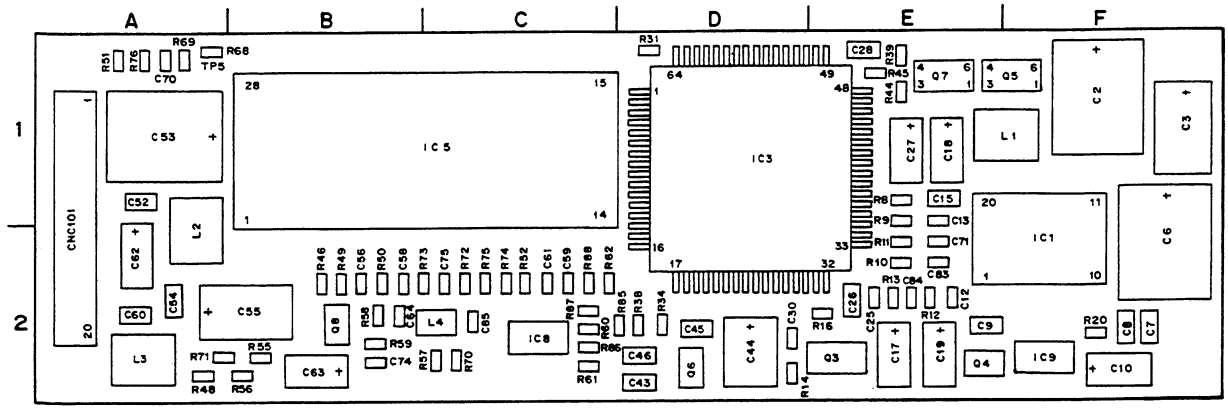
# SECTION C
# SCHEMATIC DIAGRAM AND BOARD ILLUSTRATION

## C-1.XC-999/999P SCHEMATIC DIAGRAMS AND BOARD ILLUSTRATIONS

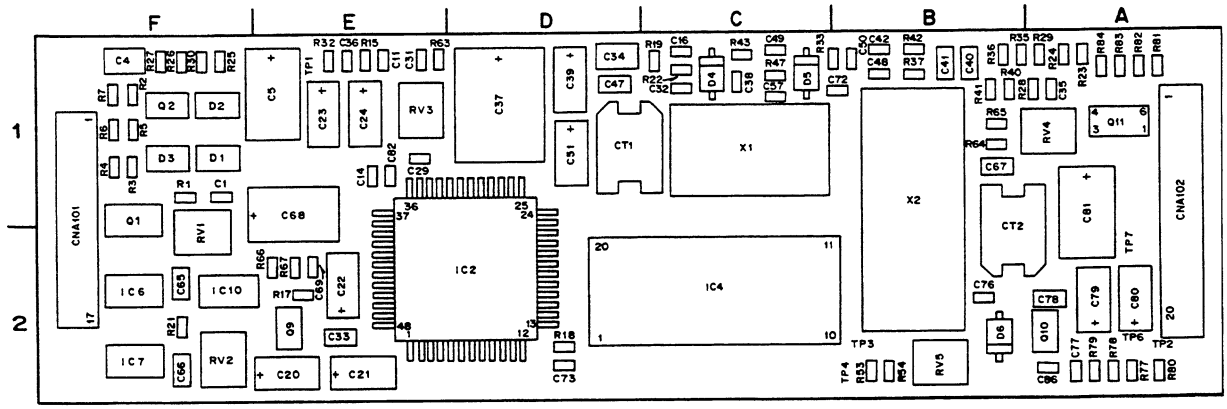
### XC-999/999P BOARD LAYOUT



## TG-89/89P BOARD




**TG-89** -A SIDE-
1-641-269-11,12,13
XC-999(UCJ)
XC-999P(EK)

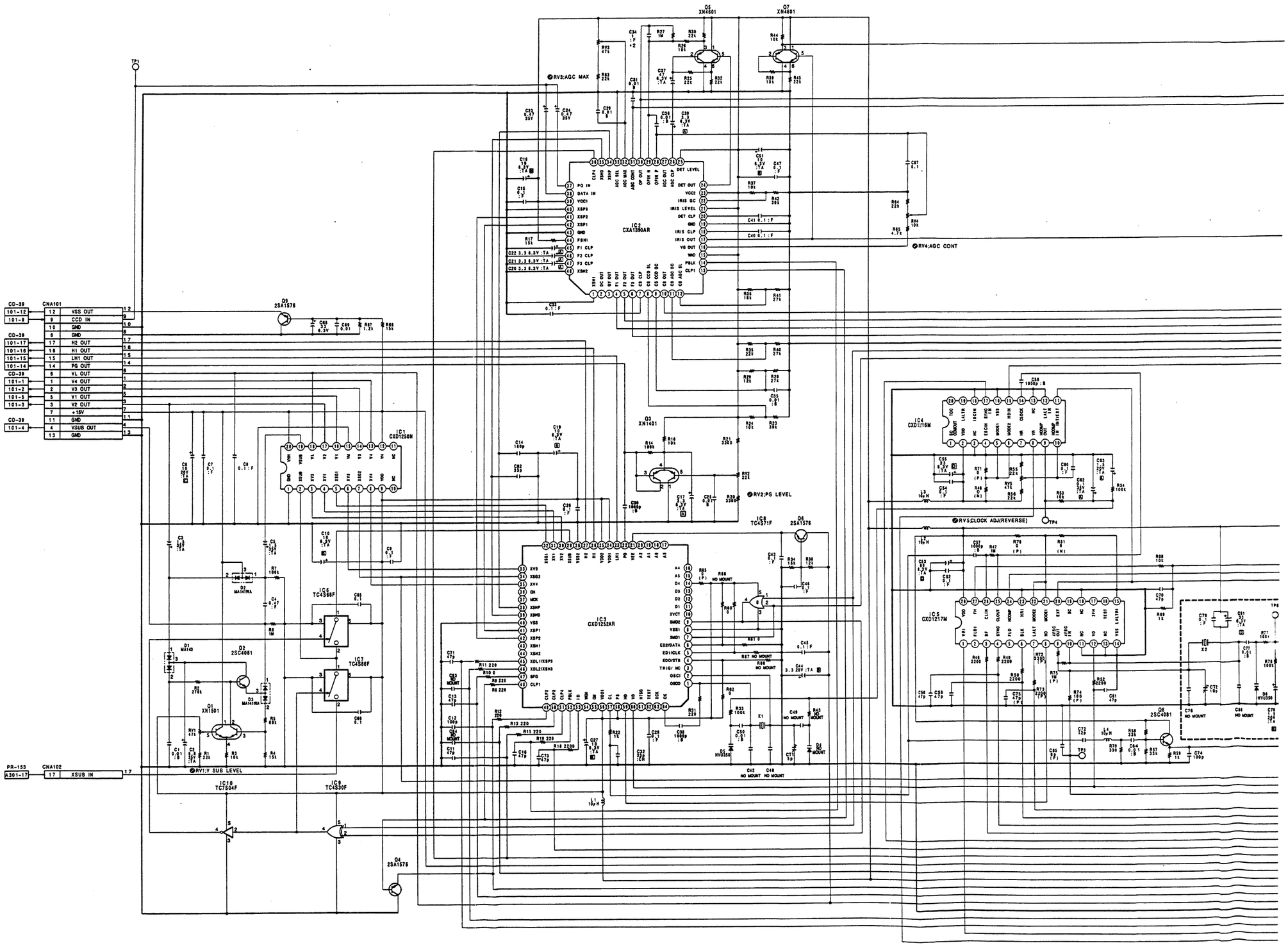



**TG-89** -B SIDE-
1-641-269-11,12,13
XC-999(UCJ)
XC-999P(EK)

## TG-89/89P BOARD

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *CNA101 | F-1 | IC1 | F-2 | Q4 | E-2 | *TP1 | E-1 |
| *CNA102 | A-1 | *IC2 | D-2 | Q5 | F-1 | *TP2 | A-2 |
| | | IC3 | D-1 | Q6 | D-2 | *TP3 | B-2 |
| CNC101 | A-1 | *IC4 | C-2 | Q7 | E-1 | *TP4 | B-2 |
| | | IC5 | C-1 | Q8 | B-2 | TP5 | A-1 |
| *CT1 | D-1 | *IC6 | F-2 | *Q9 | E-2 | *TP6 | A-2 |
| *CT2 | B-2 | *IC7 | F-2 | *Q10 | A-2 | *TP7 | A-2 |
| | | IC8 | C-2 | *Q11 | A-1 | | |
| *D1 | F-1 | IC9 | F-2 | | | *X1 | C-1 |
| *D2 | F-1 | *IC10 | F-2 | *RV1 | F-2 | *X2 | B-1 |
| *D3 | F-1 | | | *RV2 | F-2 | | |
| *D4 | C-1 | *Q1 | F-1 | *RV3 | E-1 | *; B SIDE | |
| *D5 | C-1 | *Q2 | F-1 | *RV4 | A-1 | | |
| *D6 | B-2 | Q3 | E-2 | *RV5 | B-2 | | |

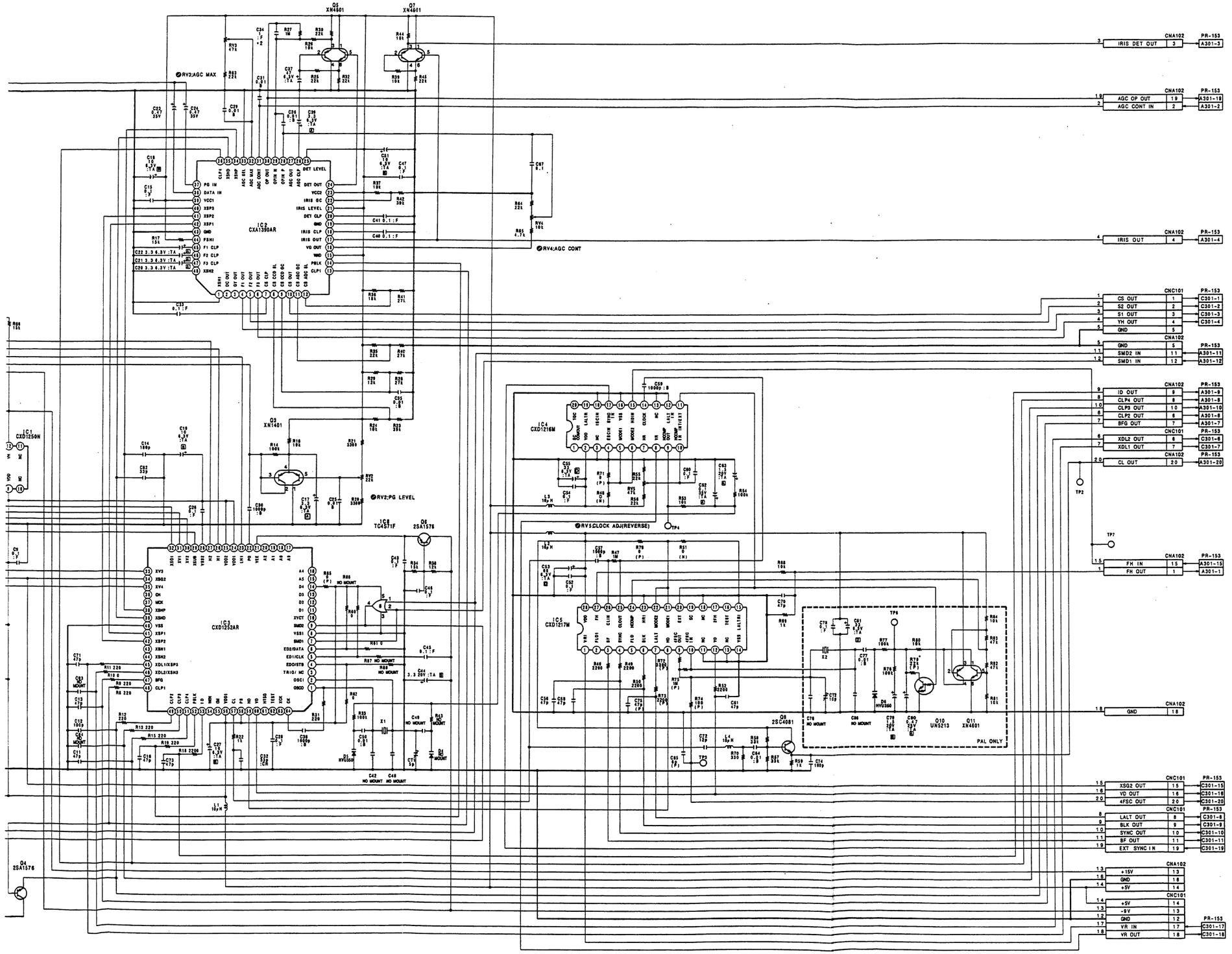
## TG-89/89P BOARD




XC-999(UCJ)
XC-999P(EK)
B-¥XC999-TG89/M

C-3

C-4




| REF.NO | CHANGE INFORMATION | SERIAL NO |
|---|---|---|
| R79 | 33K → 22K | 12911- (EK) |

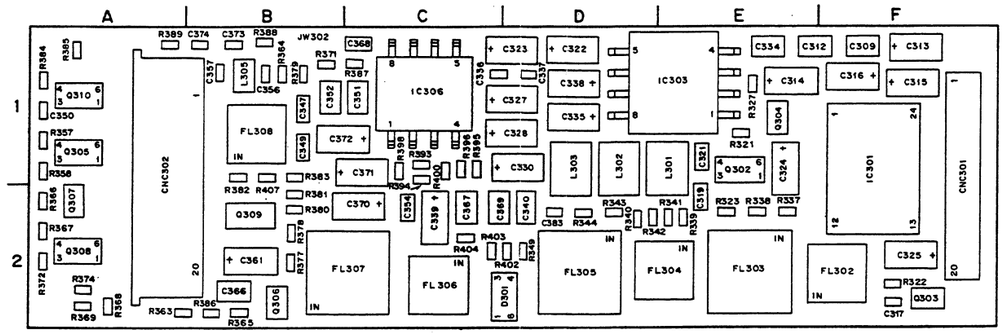
**NOTE**

NM: NO MOUNT

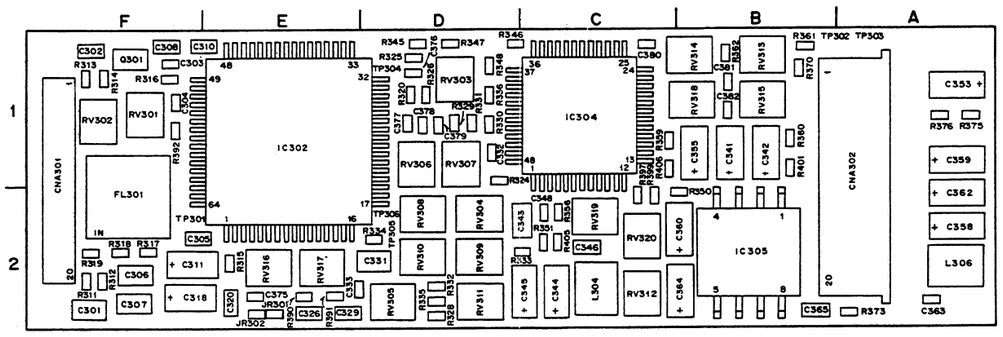
# TG-89/89P BOARD

XC-999(UCJ)
XC-999P(EK)

## PR-153/153P BOARD




**PR-153** -A SIDE-
1-641-270-11,12,13
XC-999(UCJ)
XC-999P(EK)

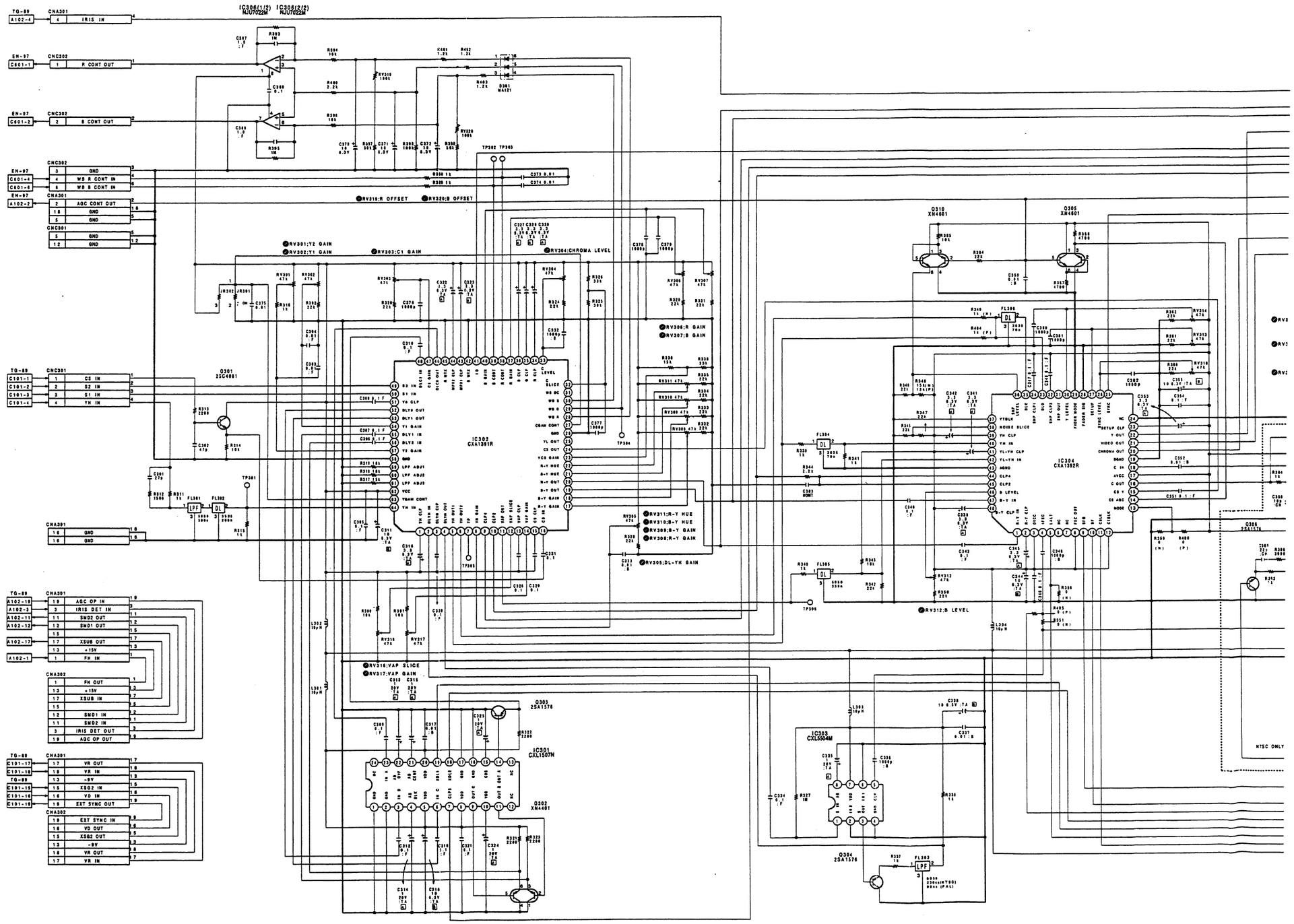


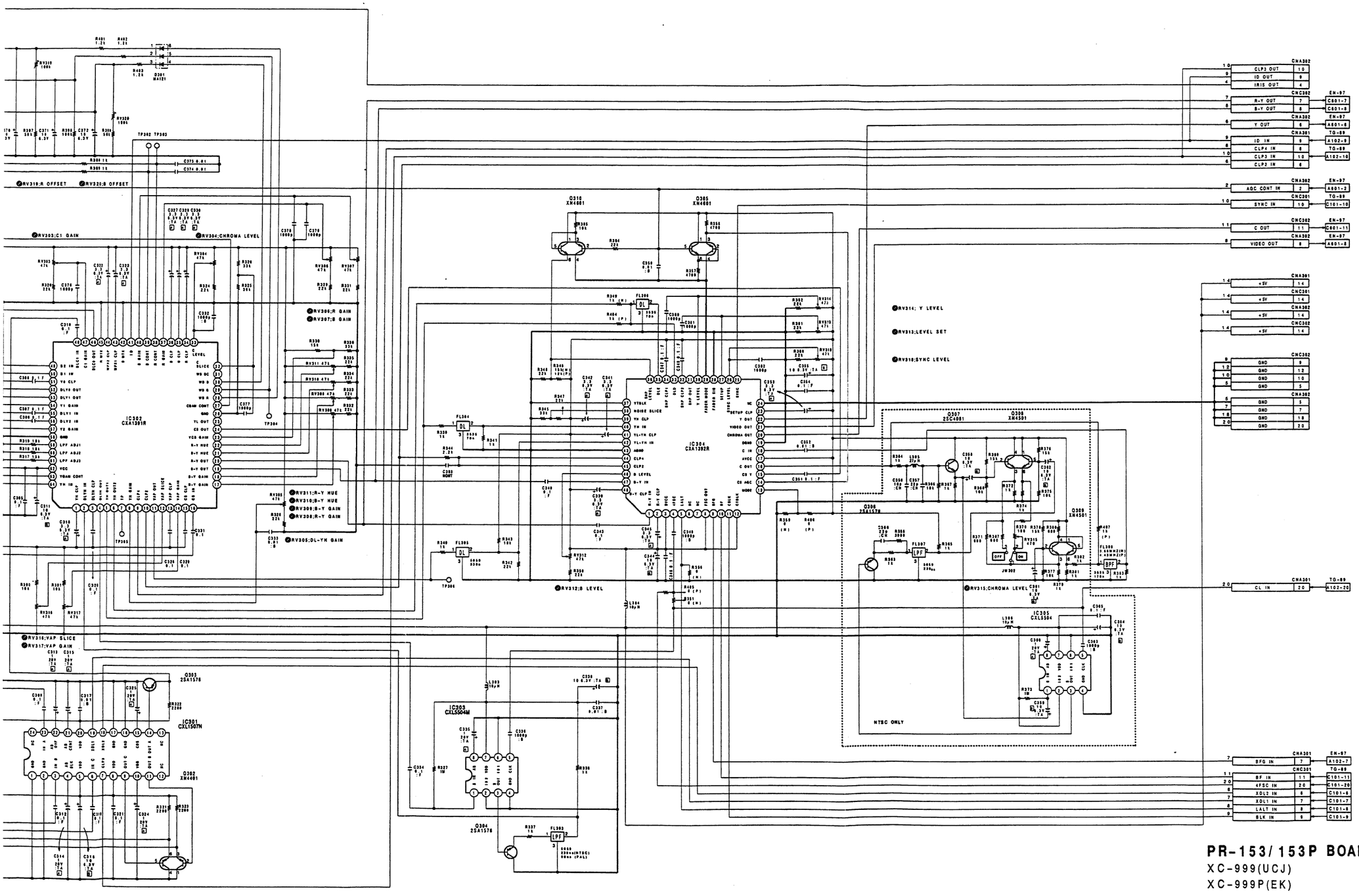

**PR-153** -B SIDE-
1-641-270-11,12,13
XC-999(UCJ)
XC-999P(EK)

## PR-153/153P BOARD

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| *CNA301 | F-1 | FL307 | F-2 | Q305 | A-1 | *RV308 | D-2 | *TP301 | F-2 |
| *CNA302 | A-1 | FL308 | B-2 | Q306 | B-2 | *RV309 | D-2 | *TP302 | A-1 |
| | | | | Q307 | A-2 | *RV310 | D-2 | *TP303 | A-1 |
| CNC301 | F-1 | IC301 | F-1 | Q308 | A-2 | *RV311 | D-2 | *TP304 | D-1 |
| CNC302 | A-1 | *IC302 | E-1 | Q309 | B-2 | *RV312 | C-2 | *TP305 | D-2 |
| | | IC303 | E-1 | Q310 | A-1 | *RV313 | B-1 | *TP306 | D-2 |
| D301 | D-2 | *IC304 | C-1 | | | *RV314 | B-1 | | |
| | | *IC305 | B-2 | *RV301 | F-1 | *RV315 | B-1 | *; B SIDE | |
| *FL301 | F-2 | IC306 | C-1 | *RV302 | F-1 | *RV316 | E-2 | | |
| FL302 | F-2 | | | *RV303 | D-1 | *RV317 | E-2 | | |
| FL303 | E-2 | *Q301 | F-1 | *RV304 | D-2 | *RV318 | B-1 | | |
| FL304 | E-2 | Q302 | E-1 | *RV305 | D-2 | *RV319 | C-2 | | |
| FL305 | D-2 | Q303 | F-2 | *RV306 | D-1 | *RV320 | C-2 | | |
| FL306 | C-2 | Q304 | E-1 | *RV307 | D-1 | | | | |

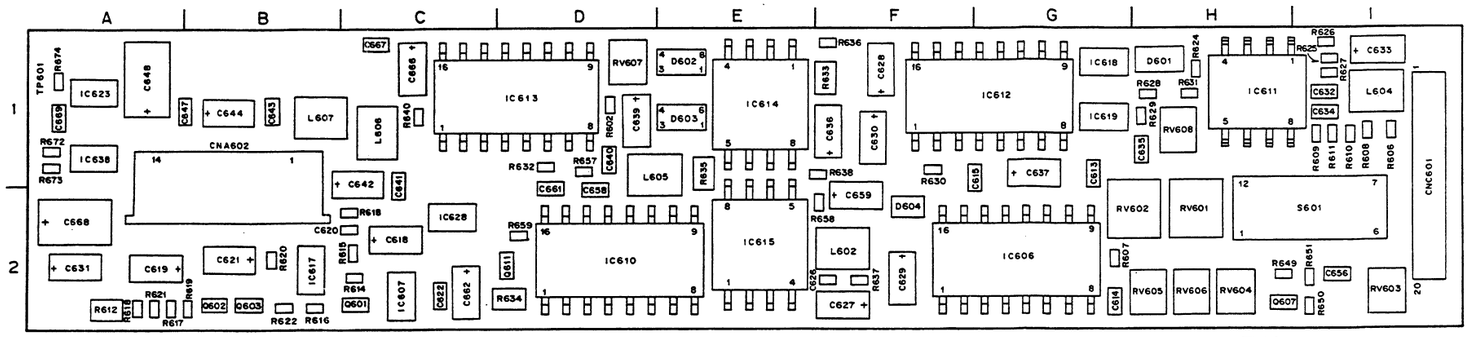
## PR-153/153P BOARD



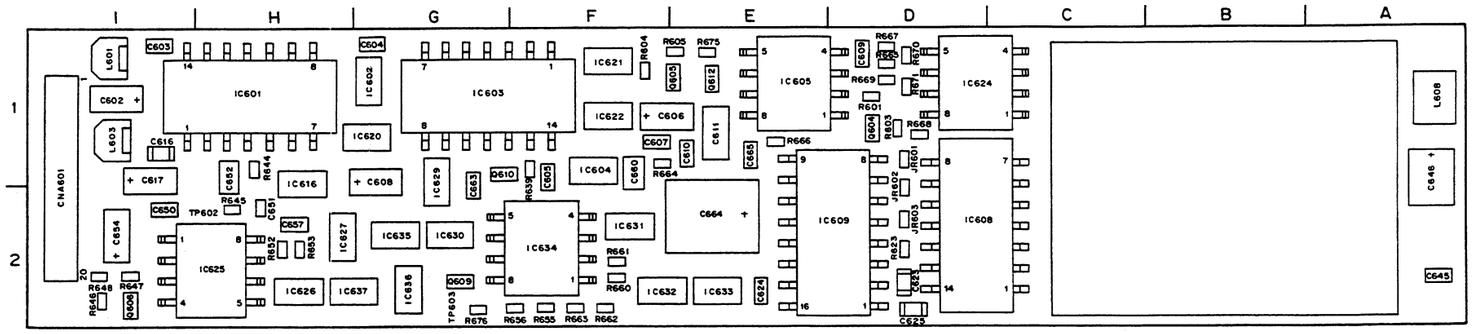



**PR-153/153P BOARD**
XC-999(UCJ)
XC-999P(EK)

## EN-97/97P BOARD




**EN-97** -A SIDE-
1-641-271-11,12,13
XC-999(UCJ)
XC-999P(EK)

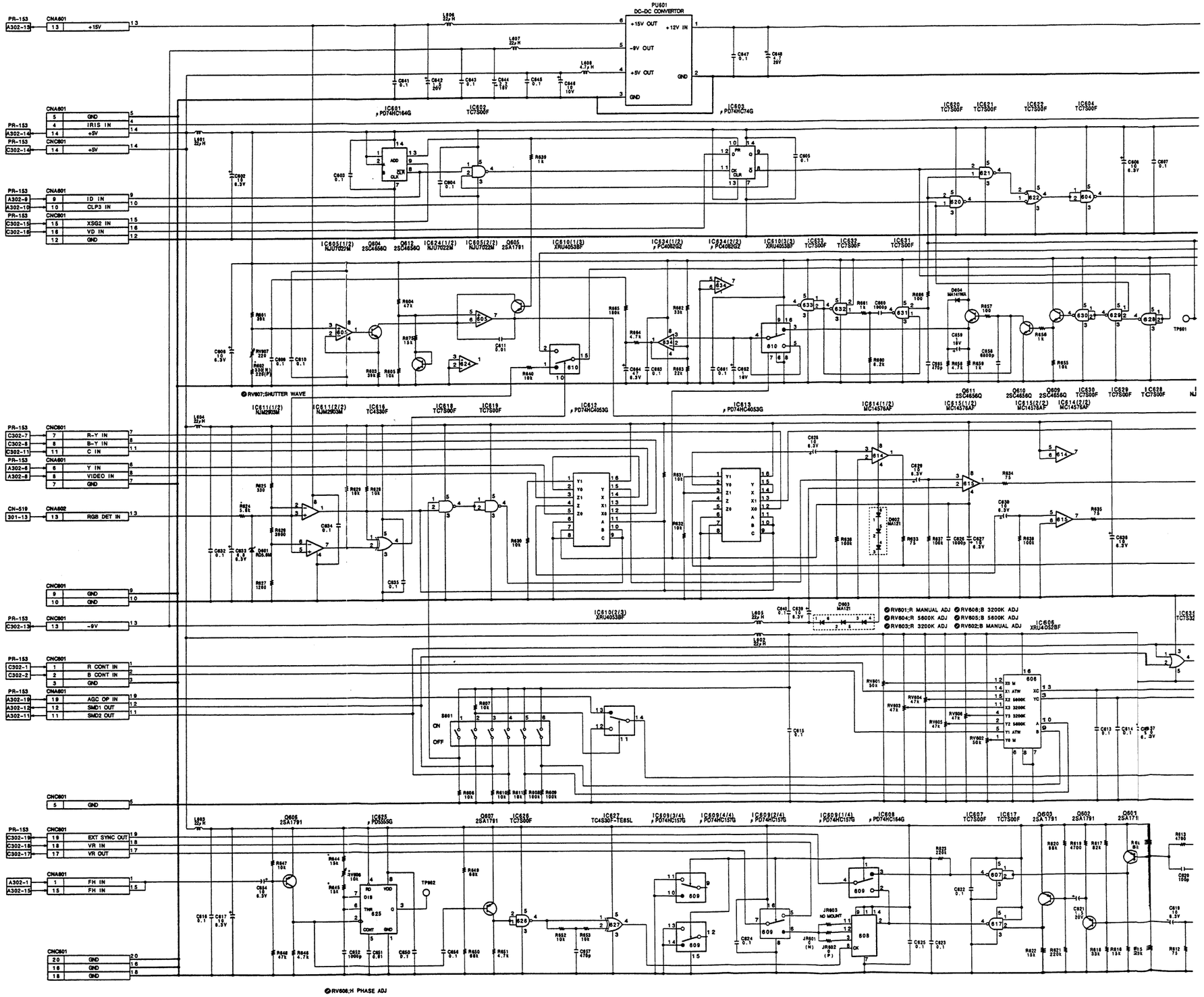



**EN-97** -B SIDE-
1-641-271-11,12,13
XC-999(UCJ)
XC-999P(EK)

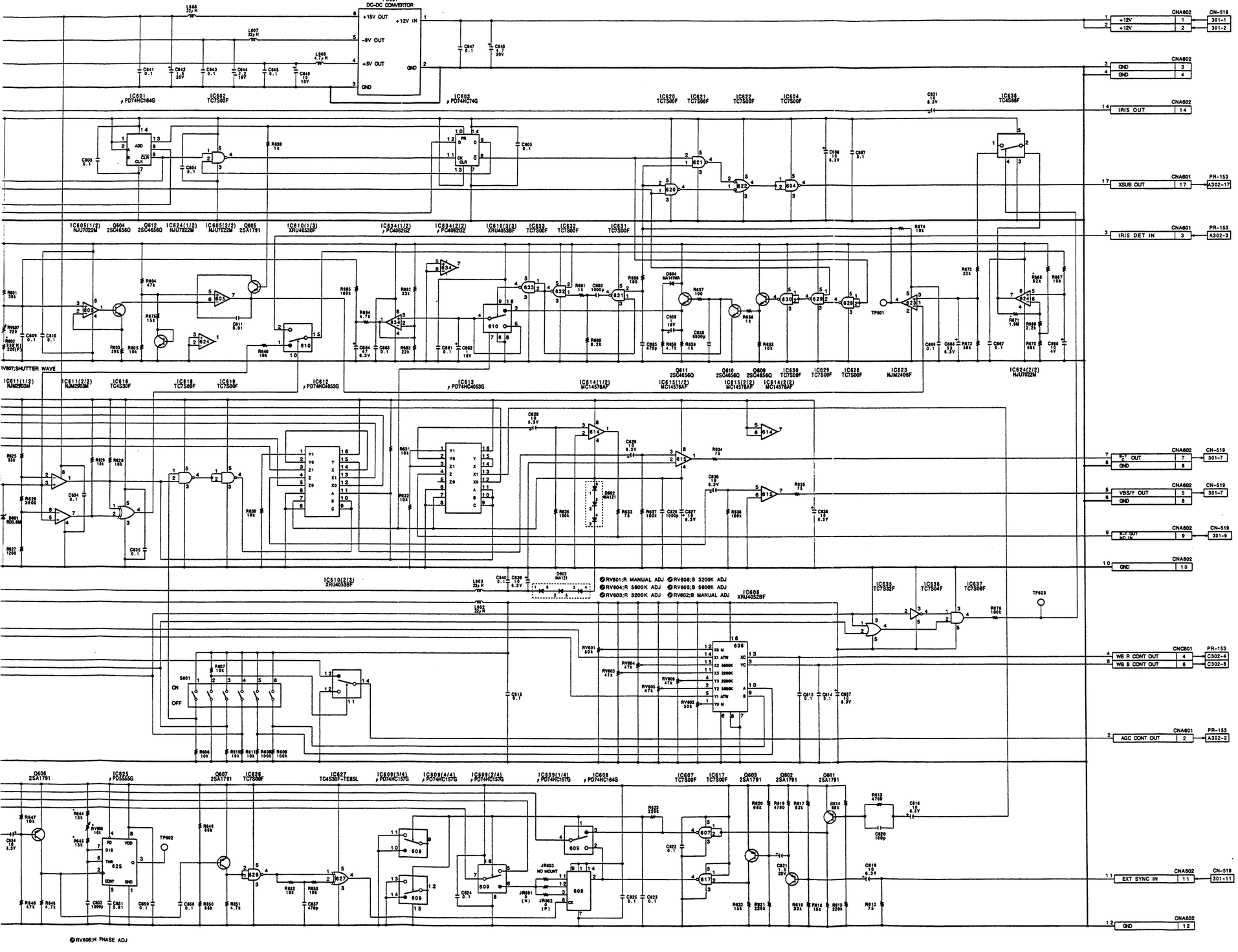
## EN-97/97P BOARD

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *CNA601 | I-1 | IC607 | C-2 | IC623 | A-1 | Q601 | C-2 | RV605 | H-2 |
| CNA602 | B-1 | *IC608 | D-2 | *IC624 | D-1 | Q602 | B-2 | RV606 | H-2 |
| | | *IC609 | D-2 | *IC625 | H-2 | Q603 | B-2 | RV607 | D-1 |
| CNC601 | I-1 | IC610 | D-2 | *IC626 | H-2 | *Q604 | D-1 | RV608 | H-1 |
| | | IC611 | H-1 | *IC627 | H-2 | *Q605 | E-1 | | |
| D601 | H-1 | IC612 | G-1 | IC628 | C-2 | *Q606 | I-2 | S601 | I-2 |
| D602 | E-1 | IC613 | D-1 | *IC629 | G-1 | Q607 | H-2 | | |
| D603 | E-1 | IC614 | E-1 | *IC630 | G-2 | *Q609 | G-2 | TP601 | A-1 |
| D604 | F-2 | IC615 | E-2 | *IC631 | F-2 | *Q610 | G-1 | *TP602 | H-2 |
| | | *IC616 | H-2 | *IC632 | F-2 | Q611 | D-2 | *TP603 | G-2 |
| *IC601 | H-1 | IC617 | B-2 | *IC633 | E-2 | *Q612 | E-1 | | |
| *IC602 | G-1 | IC618 | G-1 | *IC634 | F-2 | | | *; B SIDE | |
| *IC603 | G-1 | IC619 | G-1 | *IC635 | G-2 | RV601 | H-2 | | |
| *IC604 | F-1 | *IC620 | G-1 | *IC636 | G-2 | RV602 | G-2 | | |
| *IC605 | E-1 | *IC621 | F-1 | *IC637 | H-2 | RV603 | I-2 | | |
| IC606 | G-2 | *IC622 | F-1 | IC638 | A-1 | RV604 | H-2 | | |

## EN-97/97P BOARD



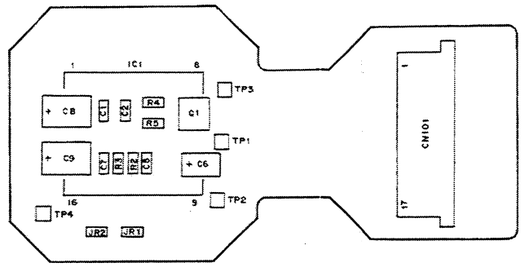
| REF.NO | CHANGE INFORMATION | SERIAL NO |
|---|---|---|
| R644 | 33K → 15K | 10471- (UCJ) |
| R645 | 1.5K → 15K | 10311- (EK) |
| RV608 | 4.7K → 10K | |
| R624 | 1K → 5.6K | |
| R668 | 100K → 82K | |
| R671 | 270K → 1.0M | |
| R602 | 330 → 220 | 10311- (EK) |




## EN-97/97P BOARD

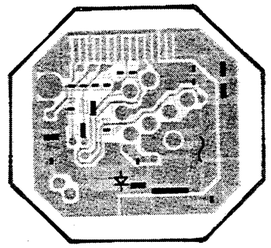
XC-999 (UCJ)
XC-999P (EK)

## CD-39 BOARD

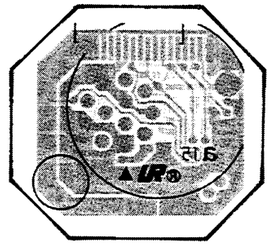



**CD-39**
1-641-273-11,12
XC-999(UCJ)
XC-999P(EK)

## CN-519 BOARD

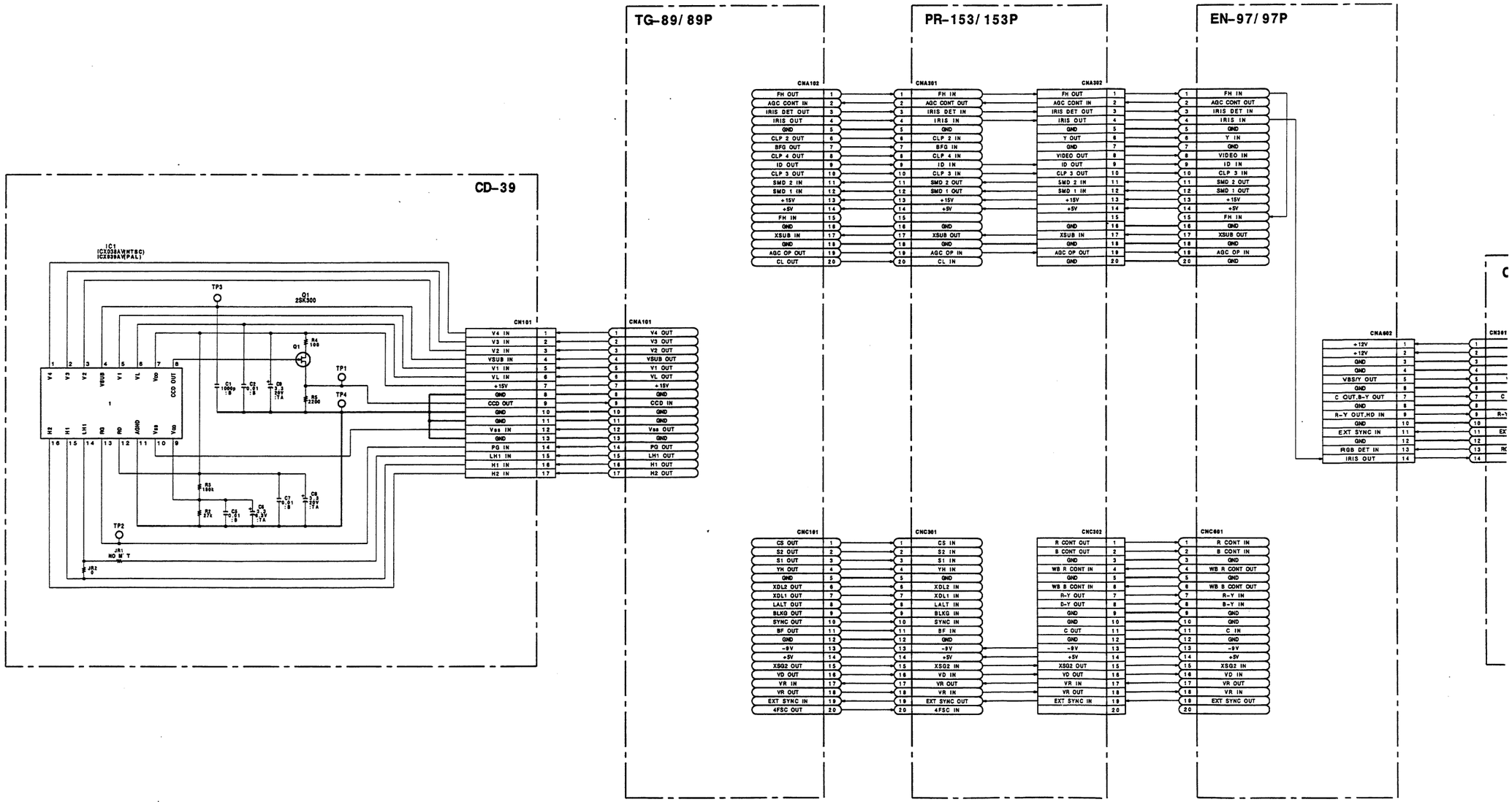


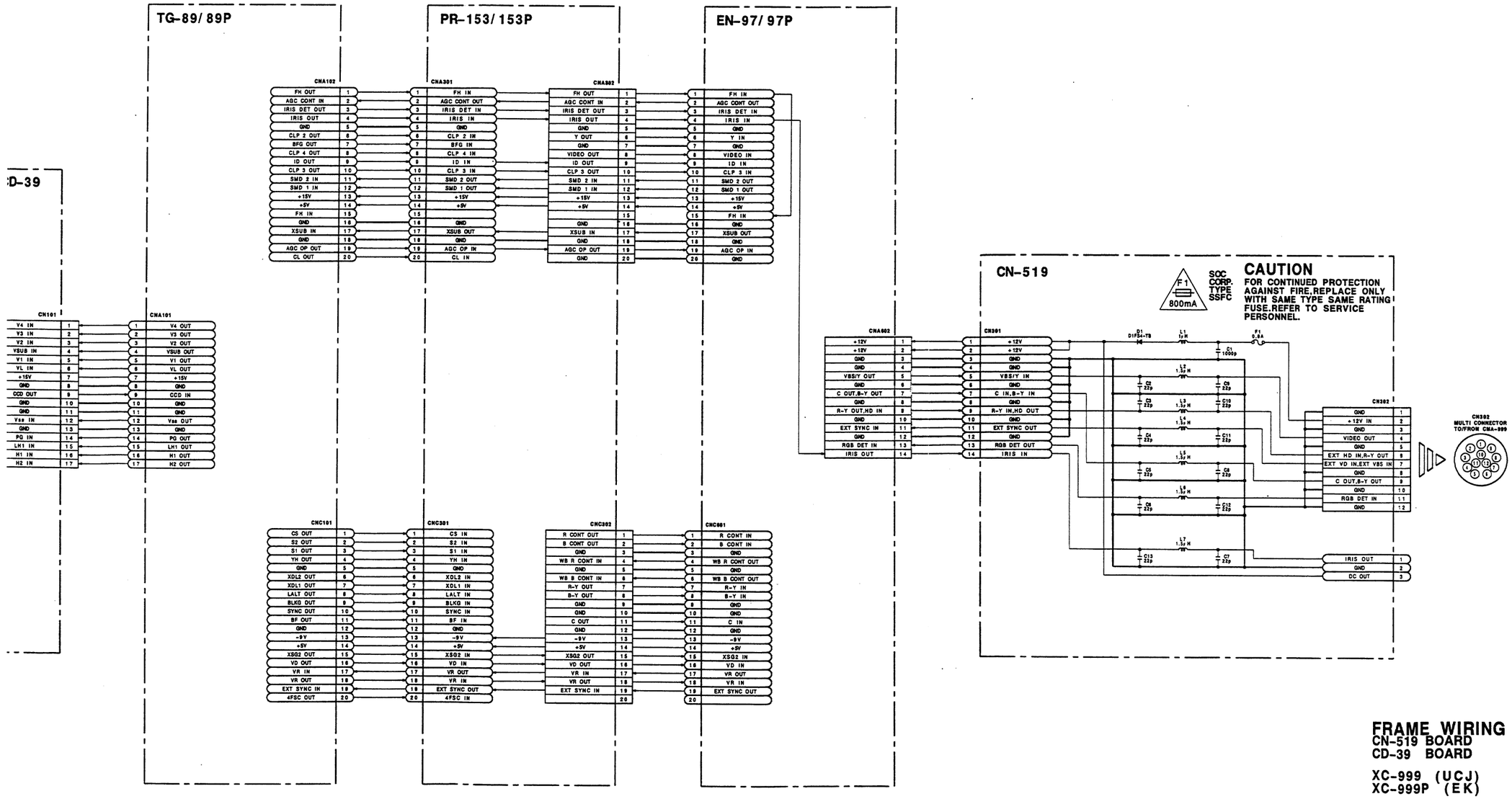
**CN-519** -A SIDE-
1-641-272-11,12
XC-999(UCJ)
XC-999P(EK)



**CN-519** -B SIDE-
1-641-272-11,12
XC-999(UCJ)
XC-999P(EK)

# XC-999/999P
# FRAME WIRING
## CD-39 BOARD
## CN-519 BOARD



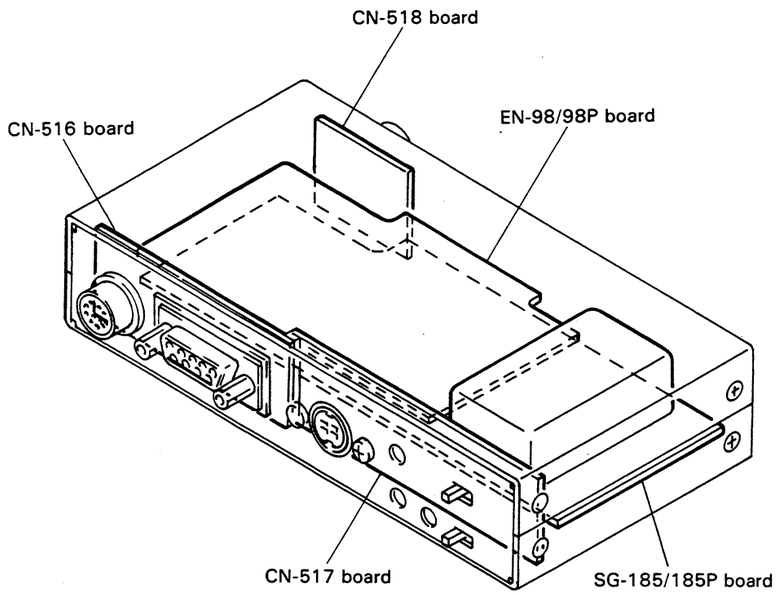



**FRAME WIRING**
**CN-519 BOARD**
**CD-39 BOARD**

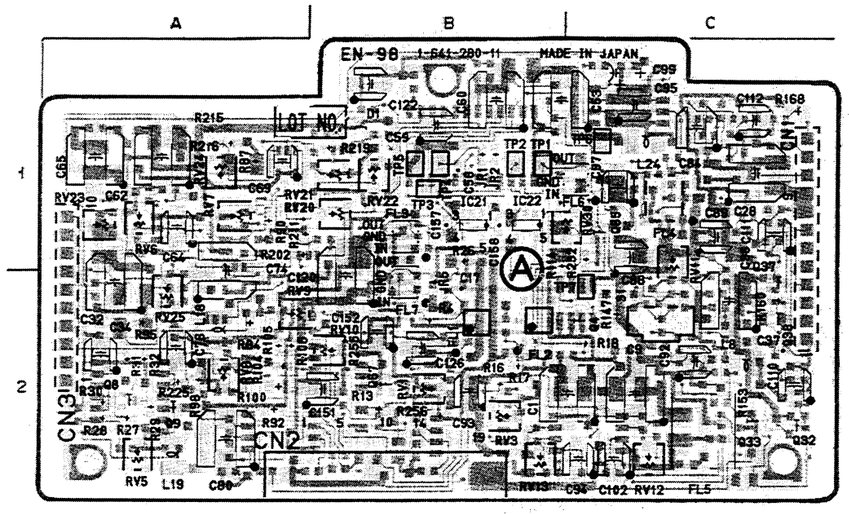
**XC-999 (UCJ)**
**XC-999P (EK)**

## C-2.CMA-999/999P SCHEMATIC DIAGRAMS AND BOARD ILLUSTRATIONS

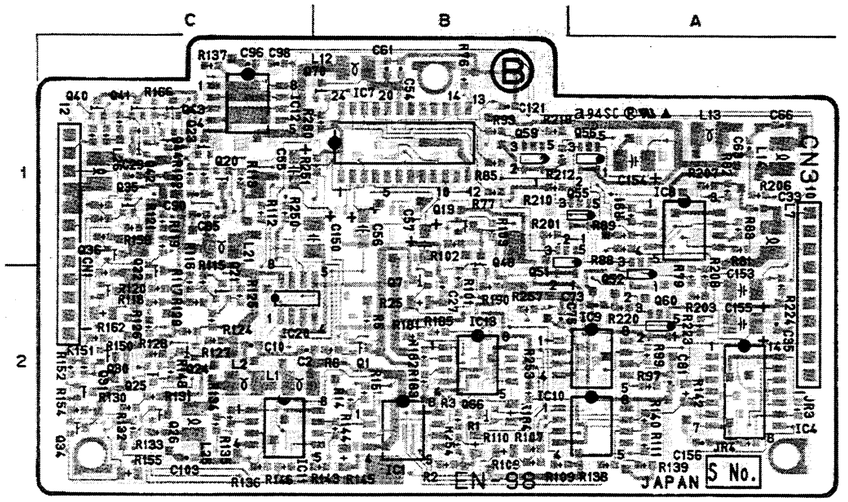
### CMA-999/999P BOARD LAYOUT



EN-98/98P BOARD

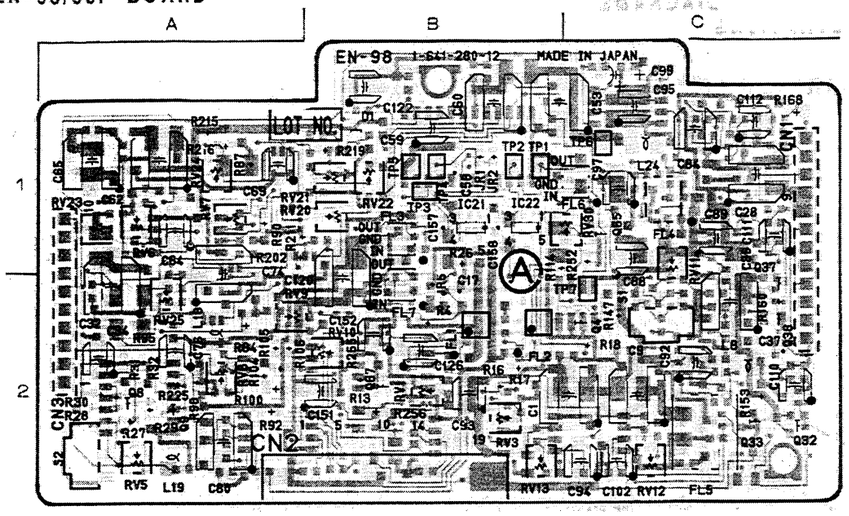



**EN-98** -A SIDE-
1-641-280-11
CMA-999(UCJ)
CMA-999P(EK)

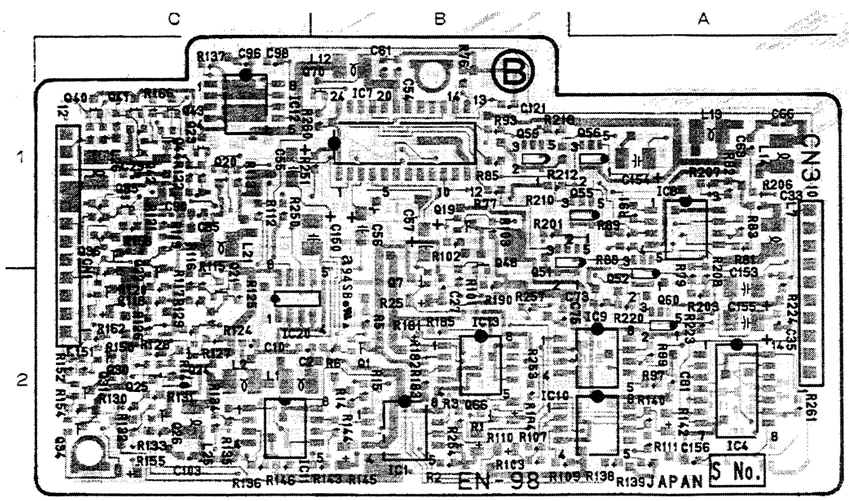



**EN-98** -B SIDE-
1-641-280-11
CMA-999(UCJ)
CMA-999P(EK)

EN-98/98P BOARD




**EN-98** -A SIDE-
1-641-280-12
CMA-999(UCJ)
CMA-999P(EK)




**EN-98** -B SIDE-
1-641-280-12
CMA-999(UCJ)
CMA-999P(EK)

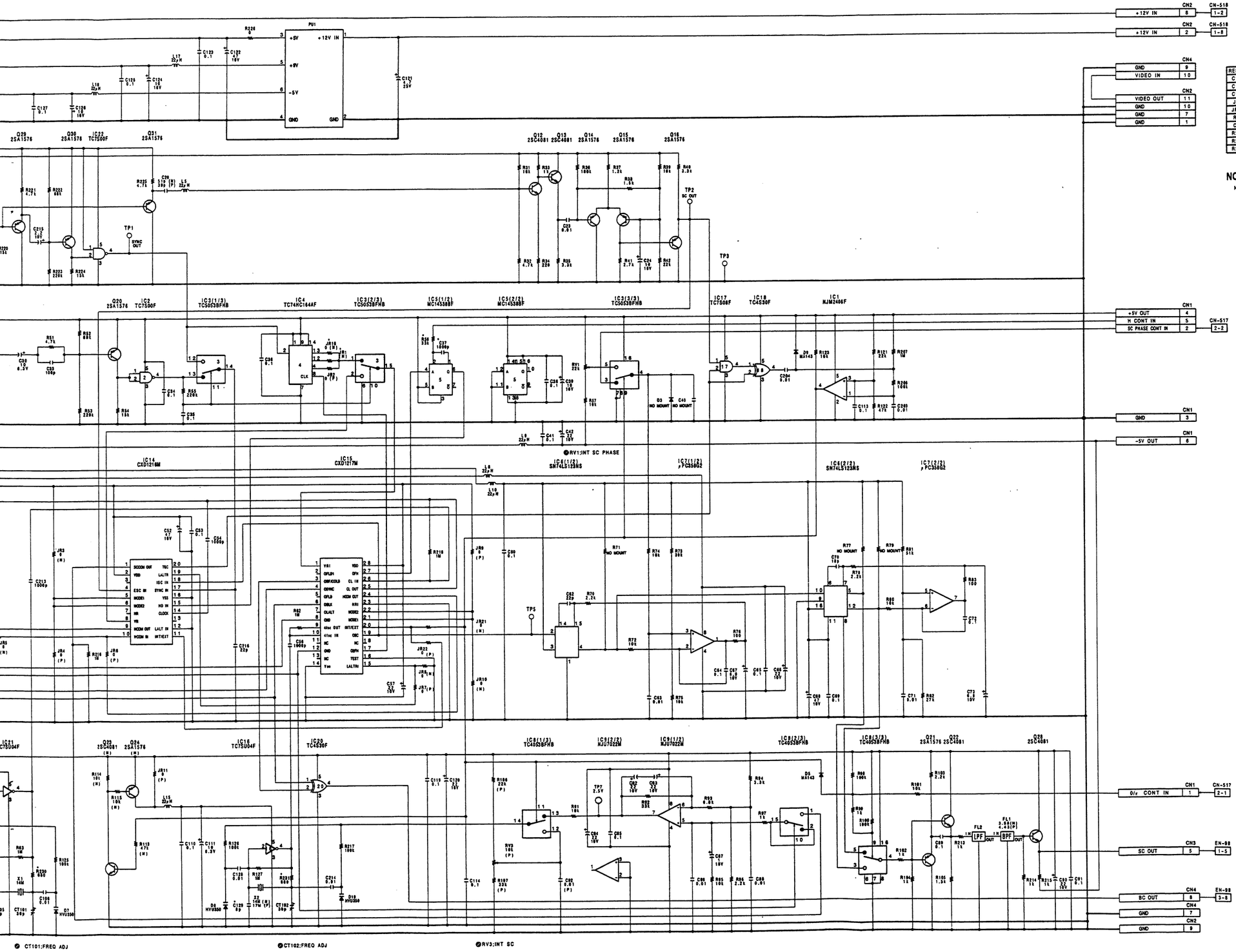
EN-98/98P BOARD

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN1 | C-1 | FL6 | C-1 | *IC13 | B-2 | *Q20 | C-1 | *Q34 | C-2 | *Q51 | B-2 | RV1 | B-2 | RV20 | A-1 |
| CN2 | A-2 | FL7 | B-2 | *IC20 | C-2 | *Q21 | C-2 | *Q35 | C-1 | *Q52 | A-2 | RV3 | B-2 | RV21 | A-1 |
| CN3 | A-2 | | | IC21 | B-1 | *Q22 | C-2 | *Q36 | C-1 | *Q55 | A-1 | RV5 | A-2 | RV22 | B-1 |
| | | *IC1 | B-2 | IC22 | B-1 | *Q23 | C-1 | Q37 | C-1 | *Q56 | A-1 | RV6 | A-1 | RV23 | A-1 |
| D1 | B-1 | *IC4 | A-2 | | | *Q24 | C-2 | Q38 | C-2 | *Q59 | B-1 | RV7 | A-1 | RV24 | A-1 |
| | | *IC7 | B-1 | *Q1 | B-2 | *Q25 | C-2 | *Q40 | C-1 | *Q60 | A-2 | RV8 | A-2 | RV25 | A-2 |
| FL1 | B-2 | *IC8 | A-1 | Q4 | C-2 | *Q26 | C-2 | *Q41 | C-1 | Q65 | C-1 | RV9 | A-2 | RV30 | C-1 |
| FL2 | B-2 | *IC9 | A-2 | *Q7 | B-2 | *Q30 | C-2 | *Q42 | C-1 | *Q66 | B-2 | RV10 | B-2 | | |
| FL3 | B-1 | *IC10 | B-2 | Q8 | A-2 | *Q31 | C-2 | *Q43 | C-1 | Q67 | B-2 | RV11 | C-1 | S1 | C-2 |
| FL4 | C-1 | *IC11 | C-2 | Q9 | A-2 | Q32 | C-2 | *Q44 | C-1 | *Q70 | B-1 | RV12 | C-2 | | |
| FL5 | C-2 | *IC12 | C-1 | *Q19 | B-1 | Q33 | C-2 | *Q48 | B-1 | | | RV13 | B-2 | *; B SIDE | |



EN-98/98P BOARD

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN1 | C-1 | FL6 | C-1 | *IC13 | B-2 | *Q20 | C-1 | *Q34 | C-2 | *Q51 | B-2 | RV1 | B-2 | RV20 | A-1 |
| CN2 | A-2 | FL7 | B-2 | *IC20 | C-2 | *Q21 | C-2 | *Q35 | C-1 | *Q52 | A-2 | RV3 | B-2 | RV21 | A-1 |
| CN3 | A-2 | | | IC21 | B-1 | *Q22 | C-2 | *Q36 | C-1 | *Q55 | A-1 | RV5 | A-2 | RV22 | B-1 |
| | | *IC1 | B-2 | IC22 | B-1 | *Q23 | C-1 | Q37 | C-1 | *Q56 | A-1 | RV6 | A-1 | RV23 | A-1 |
| D1 | B-1 | *IC4 | A-2 | | | *Q24 | C-2 | Q38 | C-2 | *Q59 | B-1 | RV7 | A-1 | RV24 | A-1 |
| | | *IC7 | B-1 | *Q1 | B-2 | *Q25 | C-2 | *Q40 | C-1 | *Q60 | A-2 | RV8 | A-2 | RV25 | A-2 |
| FL1 | B-2 | *IC8 | A-1 | Q4 | C-2 | *Q26 | C-2 | *Q41 | C-1 | Q65 | C-1 | RV9 | A-2 | RV30 | C-1 |
| FL2 | B-2 | *IC9 | A-2 | *Q7 | B-2 | *Q30 | C-2 | *Q42 | C-1 | *Q66 | B-2 | RV10 | B-2 | | |
| FL3 | B-1 | *IC10 | B-2 | Q8 | A-2 | *Q31 | C-2 | *Q43 | C-1 | Q67 | B-2 | RV11 | C-1 | S1 | C-2 |
| FL4 | C-1 | *IC11 | C-2 | Q9 | A-2 | Q32 | C-2 | *Q44 | C-1 | *Q70 | B-1 | RV12 | C-2 | | |
| FL5 | C-2 | *IC12 | C-1 | *Q19 | B-1 | Q33 | C-2 | *Q48 | B-1 | | | RV13 | B-2 | *; B SIDE | |




| REF.NO | CHANGE INFORMATION | SERIAL NO |
|---|---|---|
| C129 | 7P → 8P | 10531- (EK) |
| C129 | 7P → DELETE | 11401- (UCJ) |
| C105 | 8P → DELETE | |
| JR1 | 0 → DELETE | 10351- (UCJ) |
| JR16 | ADD | |
| R56 | 51K → 33K | 10651- (UCJ) |
| C37 | 680P → 1000P | 10431- (EK) |
| R216 | 1.0M → DELETE | 10801- (UCJ) |
| R230 | ADD | 10531- (EK) |
| R231 | ADD | |

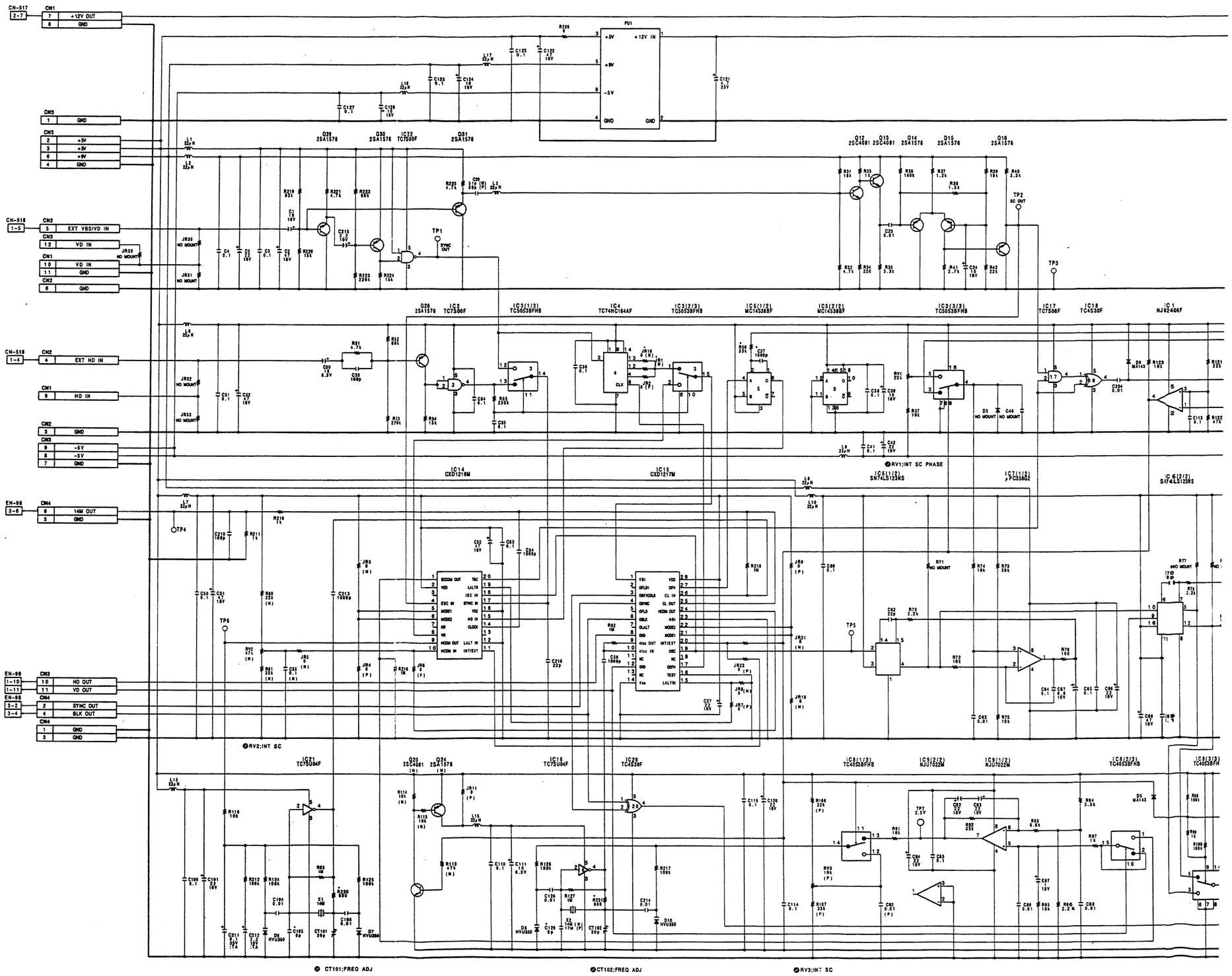
**NOTE**

NM: NO MOUNT

## SG-185/185P BOARD

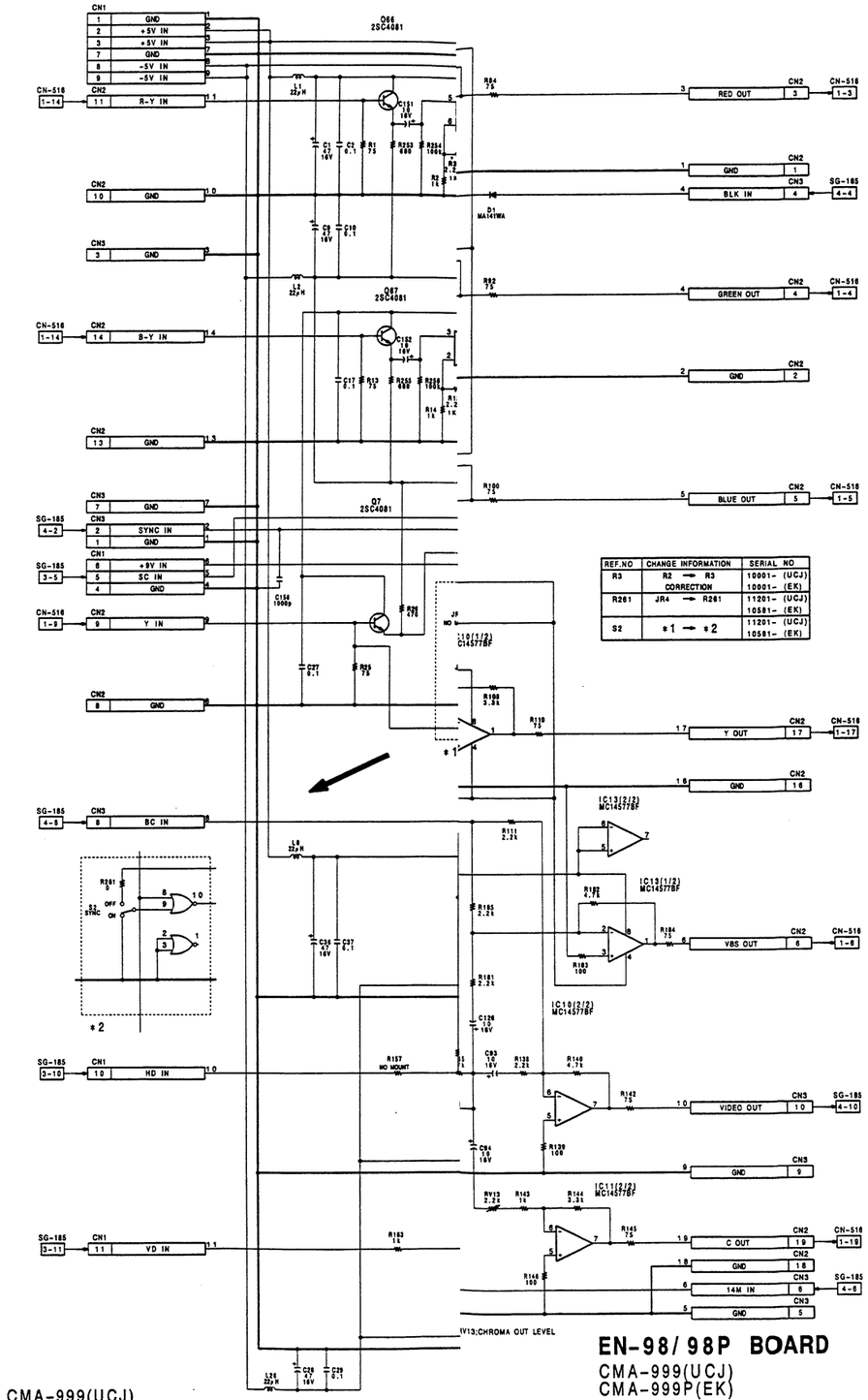
CMA-999(UCJ)
CMA-999P(EK)

## SG-185/185P BOARD




CMA-999(UCJ)
CMA-999P(EK)
B-¥CMA999-SG185/M

# EN-98/98P BOARD

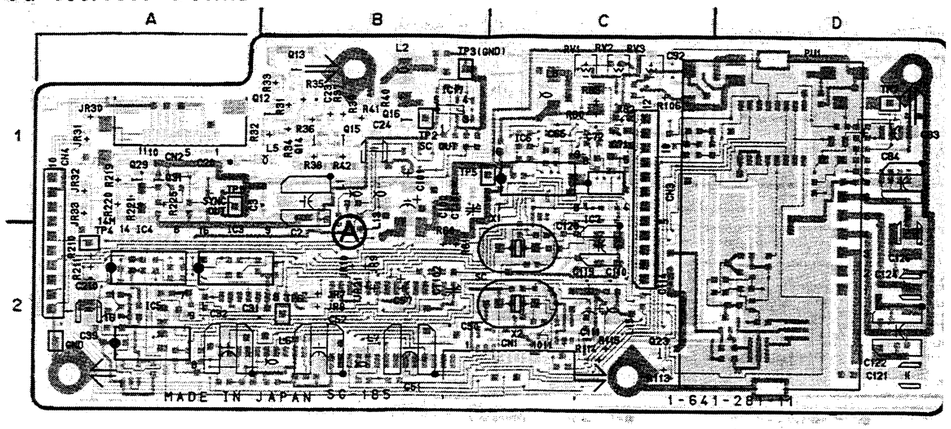



| REF.NO | CHANGE INFORMATION | SERIAL NO. |
|---|---|---|
| R3 | R2 → R3 | 10001- (UCJ) |
| | CORRECTION | 10001- (EK) |
| R261 | JR4 → R261 | 11201- (UCJ) |
| | | 10581- (EK) |
| S2 | *1 → *2 | 11201- (UCJ) |
| | | 10581- (EK) |

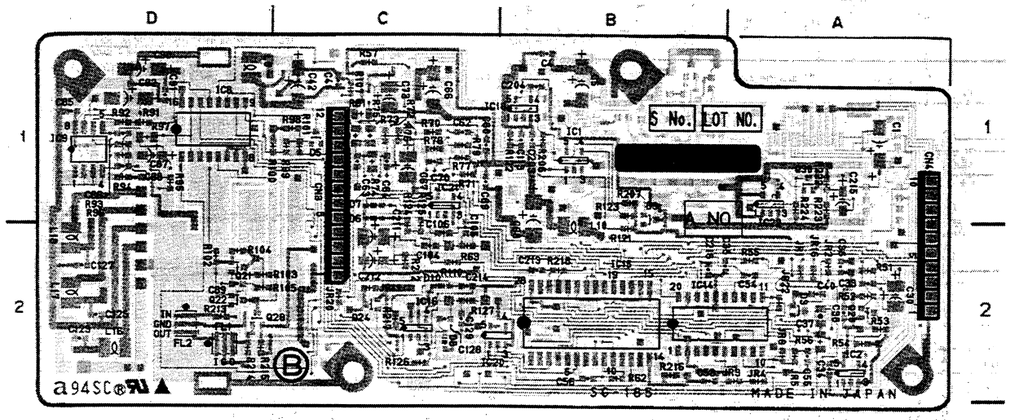
**EN-98/98P BOARD**
CMA-999(UCJ)
CMA-999P(EK)

CMA-999(UCJ)
CMA-999P(EK)
B-¥CMA999-EN98/M

SG-185/185P BOARD




**SG-185** -A SIDE
1-641-281-11,12
CMA-999(UCJ)
CMA-999P(EK)



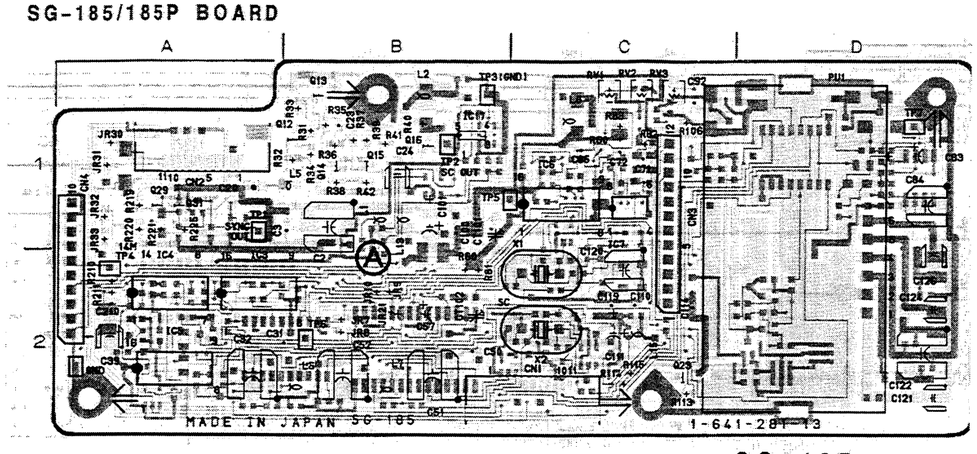

**SG-185** -B SIDE-
1-641-281-11,12
CMA-999(UCJ)
CMA-999P(EK)

SG-185/185P BOARD

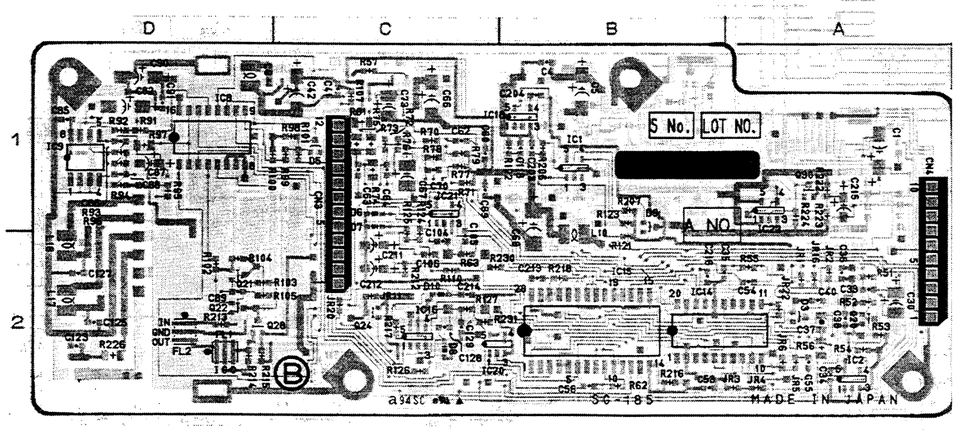
| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN1 | C-2 | *D5 | C-1 | *IC1 | B-1 | *IC9 | D-1 | PU1 | D-1 | *Q22 | D-2 | RV2 | C-1 |
| CN2 | A-1 | *D6 | C-1 | *IC2 | A-2 | *IC14 | B-2 | | | Q23 | C-2 | RV3 | C-1 |
| CN3 | C-1 | *D7 | C-1 | IC3 | A-2 | *IC15 | B-2 | Q12 | B-1 | *Q24 | C-2 | | |
| CN4 | A-1 | *D8 | C-2 | IC4 | A-2 | *IC16 | C-2 | Q13 | B-1 | *Q28 | D-2 | X1 | C-1 |
| | | *D9 | B-1 | IC5 | A-2 | IC17 | B-1 | Q14 | B-1 | Q29 | A-1 | X2 | C-2 |
| CT101 | B-1 | *D10 | C-2 | IC6 | C-1 | *IC18 | B-1 | Q15 | B-1 | *Q30 | A-1 | | |
| CT102 | B-2 | | | IC7 | C-1 | *IC20 | C-2 | Q16 | B-1 | Q31 | A-1 | *; B SIDE | |
| | | *FL1 | D-2 | *IC8 | D-1 | *IC21 | C-1 | *Q20 | A-2 | | | | |
| *D3 | A-2 | *FL2 | D-2 | | | *IC22 | A-1 | *Q21 | D-2 | RV1 | C-1 | | |



SG-185/185P BOARD




**SG-185** -A SIDE-
1-641-281-13
CMA-999(UCJ)
CMA-999P(EK)

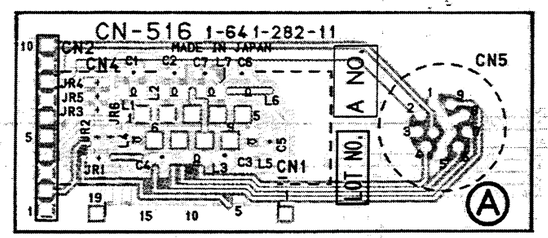



**SG-185** -B SIDE-
1-641-281-13
CMA-999(UCJ)
CMA-999P(EK)

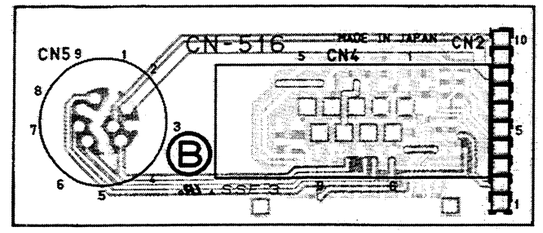
SG-185/185P BOARD

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CN1 | C-2 | *D5 | C-1 | *IC1 | B-1 | *IC9 | D-1 | PU1 | D-1 | *Q22 | D-2 | RV2 | C-1 |
| CN2 | A-1 | *D6 | C-1 | *IC2 | A-2 | *IC14 | B-2 | | | Q23 | C-2 | RV3 | C-1 |
| CN3 | C-1 | *D7 | C-1 | IC3 | A-2 | *IC15 | B-2 | Q12 | B-1 | *Q24 | C-2 | | |
| CN4 | A-1 | *D8 | C-2 | IC4 | A-2 | *IC16 | C-2 | Q13 | B-1 | *Q28 | D-2 | X1 | C-1 |
| | | *D9 | B-1 | IC5 | A-2 | IC17 | B-1 | Q14 | B-1 | Q29 | A-1 | X2 | C-2 |
| CT101 | B-1 | *D10 | C-2 | IC6 | C-1 | *IC18 | B-1 | Q15 | B-1 | *Q30 | A-1 | | |
| CT102 | B-2 | | | IC7 | C-1 | *IC20 | C-2 | Q16 | B-1 | Q31 | A-1 | *; B SIDE | |
| | | *FL1 | D-2 | *IC8 | D-1 | *IC21 | C-1 | *Q20 | A-2 | | | | |
| *D3 | A-2 | *FL2 | D-2 | | | *IC22 | A-1 | *Q21 | D-2 | RV1 | C-1 | | |

## CN-516 BOARD

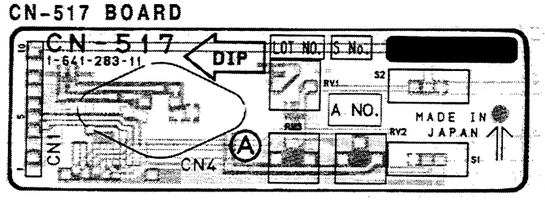



**CN-516** -A SIDE-
1-641-282-11
CMA-999(UCJ)
CMA-999P(EK)

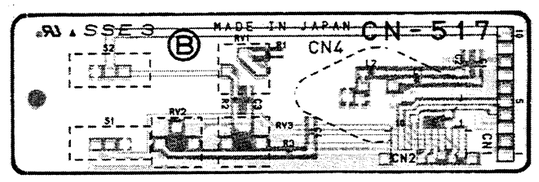



**CN-516** -B SIDE-
1-641-282-11
CMA-999(UCJ)
CMA-999P(EK)

## CN-517 BOARD

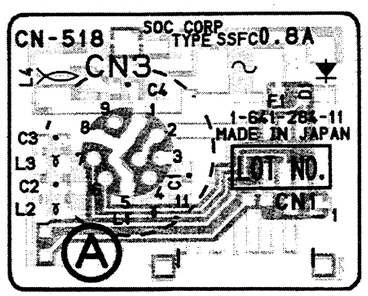



**CN-517** -A SIDE-
1-641-283-11
CMA-999(UCJ)
CMA-999P(EK)

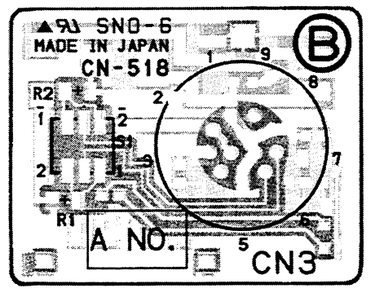



**CN-517** -B SIDE-
1-641-283-11
CMA-999(UCJ)
CMA-999P(EK)

## CN-518 BOARD

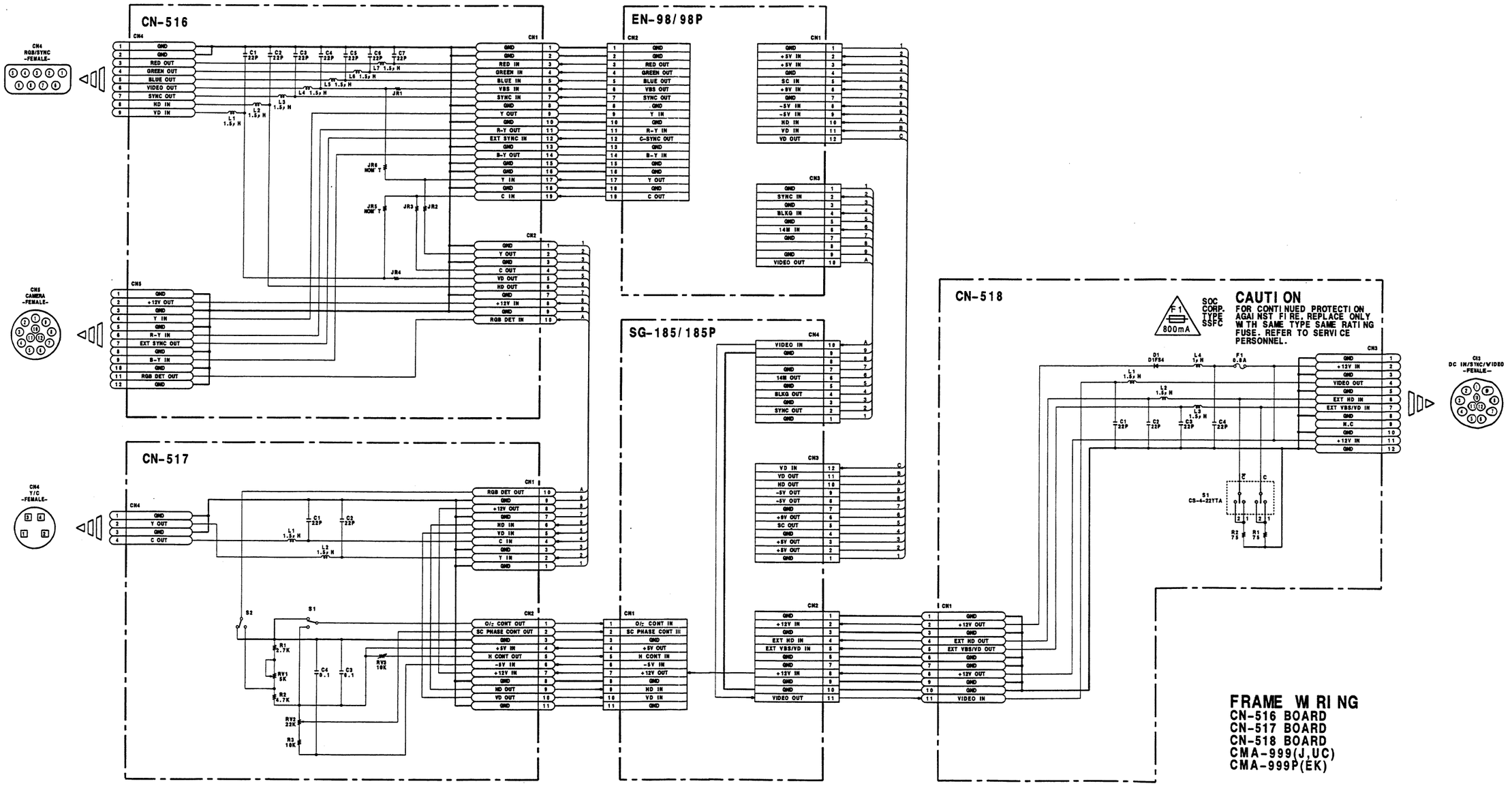



**CN-518** -A SIDE-
1-641-284-11,12
CMA-999(UCJ)
CMA-999P(EK)




**CN-518** -B SIDE-
1-641-284-11,12
CMA-999(UCJ)
CMA-999P(EK)

**CMA-999/999P**
**FRAME WIRING**
**CN-516 BOARD**
**CN-517 BOARD**
**CN-518 BOARD**


CN-516
CN-517
CN-518
EN-98/98P
SG-185/185P
CN4 RGB/SYNC -FEMALE-
CN5 CAMERA -FEMALE-
CN4 Y/C -FEMALE-
CN8 DC IN/SYNC/VIDEO -FEMALE-
CN4 GND RED OUT GREEN OUT BLUE OUT VIDEO OUT SYNC OUT HD IN VD IN
CN5 GND +12V OUT Y IN GND R-Y IN EXT SYNC OUT GND B-Y IN GND RGB DET OUT GND
CN4 GND Y OUT GND C OUT
CN1 GND GND RED IN GREEN IN BLUE IN VBS IN SYNC IN GND Y OUT GND R-Y OUT EXT SYNC IN GND B-Y OUT GND GND Y IN GND C IN
CN2 GND Y OUT GND C OUT VD OUT HD OUT GND +12V IN GND RGB DET IN
CN1 RGB DET OUT GND +12V OUT GND HD IN VD IN C IN GND Y IN GND
CN1 O/E CONT IN SC PHASE CONT IN GND +5V IN H CONT IN -5V IN +12V IN GND HD IN VD IN GND
CN2 O/E CONT OUT SC PHASE CONT OUT GND +5V IN H CONT OUT -5V IN +12V IN GND HD OUT VD OUT GND
CN2 GND GND RED OUT GREEN OUT BLUE OUT VBS OUT SYNC OUT GND Y IN GND R-Y IN C-SYNC OUT GND B-Y IN GND GND Y OUT GND C OUT
CN1 GND +5V IN +5V IN GND SC IN +5V IN GND -5V IN -5V IN HD IN VD IN VD OUT
CN3 GND SYNC IN GND BLKG IN 14M IN GND GND VIDEO OUT
CN4 VIDEO IN GND GND 14M OUT GND BLKG OUT GND SYNC OUT GND
CN3 VD IN VD OUT HD OUT -5V OUT -5V OUT GND +5V OUT SC OUT GND +5V OUT +5V OUT GND
CN2 GND +12V IN GND EXT HD IN EXT VBS/VD IN GND GND +12V IN GND GND VIDEO OUT
CN1 GND +12V OUT GND EXT HD OUT EXT VBS/VD OUT GND GND +12V OUT GND GND VIDEO IN
CN3 GND +12V IN GND VIDEO OUT GND EXT HD IN EXT VBS/VD IN GND N.C GND +12V IN GND
S1 CS-4-22YTA
F1 800mA
SOC CORP. TYPE SSFC
CAUTION
FOR CONTINUED PROTECTION AGAINST FIRE, REPLACE ONLY WITH SAME TYPE SAME RATING FUSE. REFER TO SERVICE PERSONNEL.

**FRAME WIRING**
**CN-516 BOARD**
**CN-517 BOARD**
**CN-518 BOARD**
**CMA-999(J,UC)**
**CMA-999P(EK)**

# SECTION D
# REPAIR PARTS

## D-1. PARTS INFORMATION

1. **Safety Related Components Warning.**
   Components identified by shading marked with ⚠ on the schematic diagrams, exploded views and electrical spare parts list are critical to safe operation. Replace these components with Sony parts whose part numbers appear in this manual or in service bulletins and service manual supplements published by Sony.

2. Replacement Parts supplied from Sony Parts Center will sometimes have a different shape from the original parts. This is due to "accommodating the improved parts and/or engineering changes" or "standardization of genuine parts".
   This manual's exploded views and electrical spare parts list indicate the parts numbers of "the standardized genuine parts at present". Regarding engineering parts changes in our engineering department, refer to Sony service bulletins and service manual supplements.

3. Items marked " * " are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.

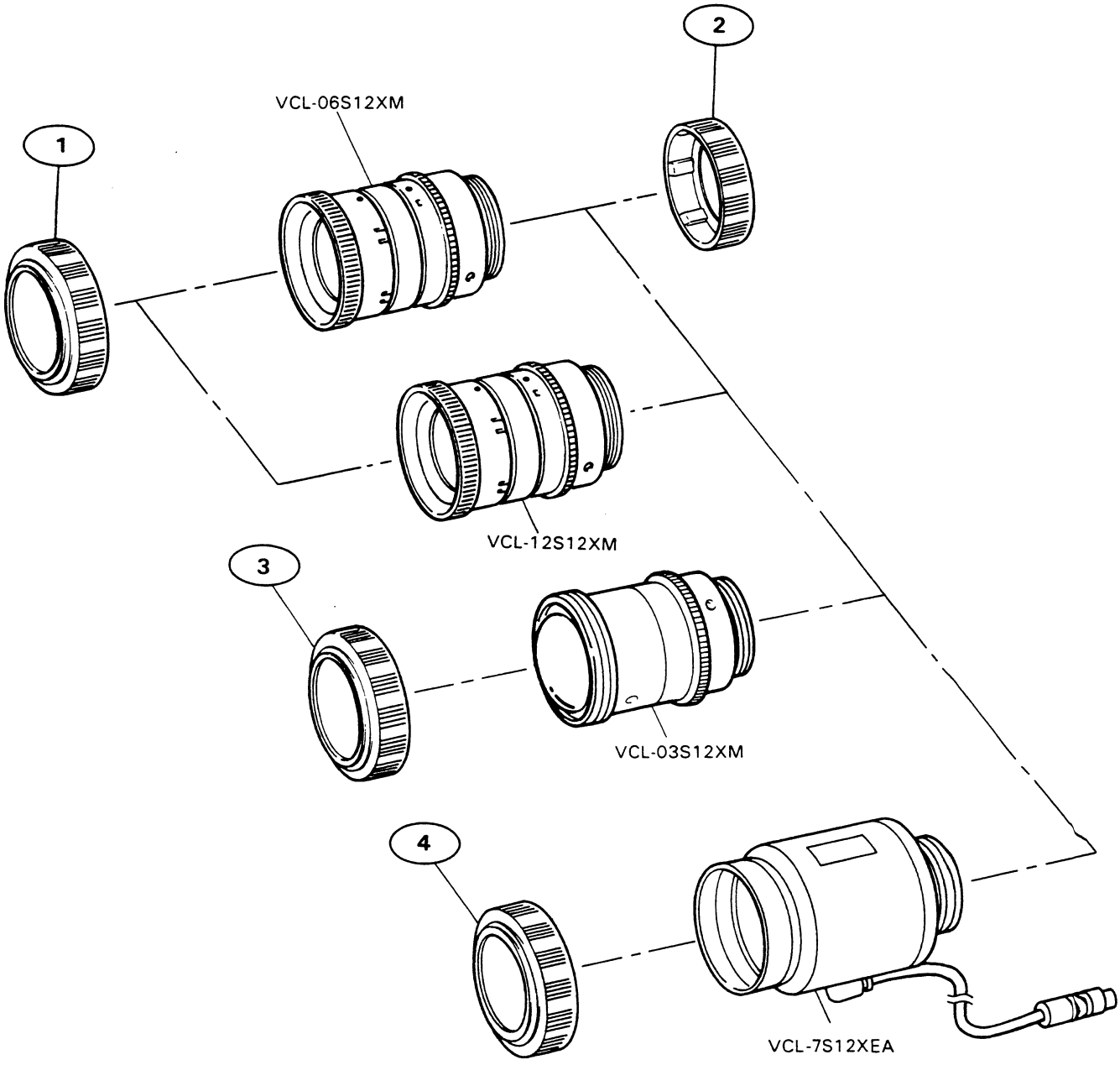
4. Abbreviations

| Ref.No. | Description | Ref.No. | Description |
|---|---|---|---|
| C??,CV?? | CAPACITOR | CN?? | CONNECTOR |
| CP?? | COMBINATION PARTS | D?? | DIODE |
| DL?? | DELAY LINE | F?? | FUSE |
| FL?? | FILTER | IC?? | IC |
| L??,LV?? | INDUCTOR | M?? | MOTOR |
| ME?? | METER | PL?? | LAMP |
| Q?? | TRANSISTOR | R??,RV?? | RESISTOR |
| RY?? | RELAY | SW?? | SWITCH |
| T?? | TRANSFORMER | TH?? | THERMISTOR |
| X?? | CRYSTAL | | |

5. Units for Capacitors, Inductors and Resistors
   The following units are assumed in schematic diagrams and electrical parts list and unless otherwise specified:
   Capacitors: micro farad
   Inductors: micro henry
   Resistors: ohm

## D-2. LENS

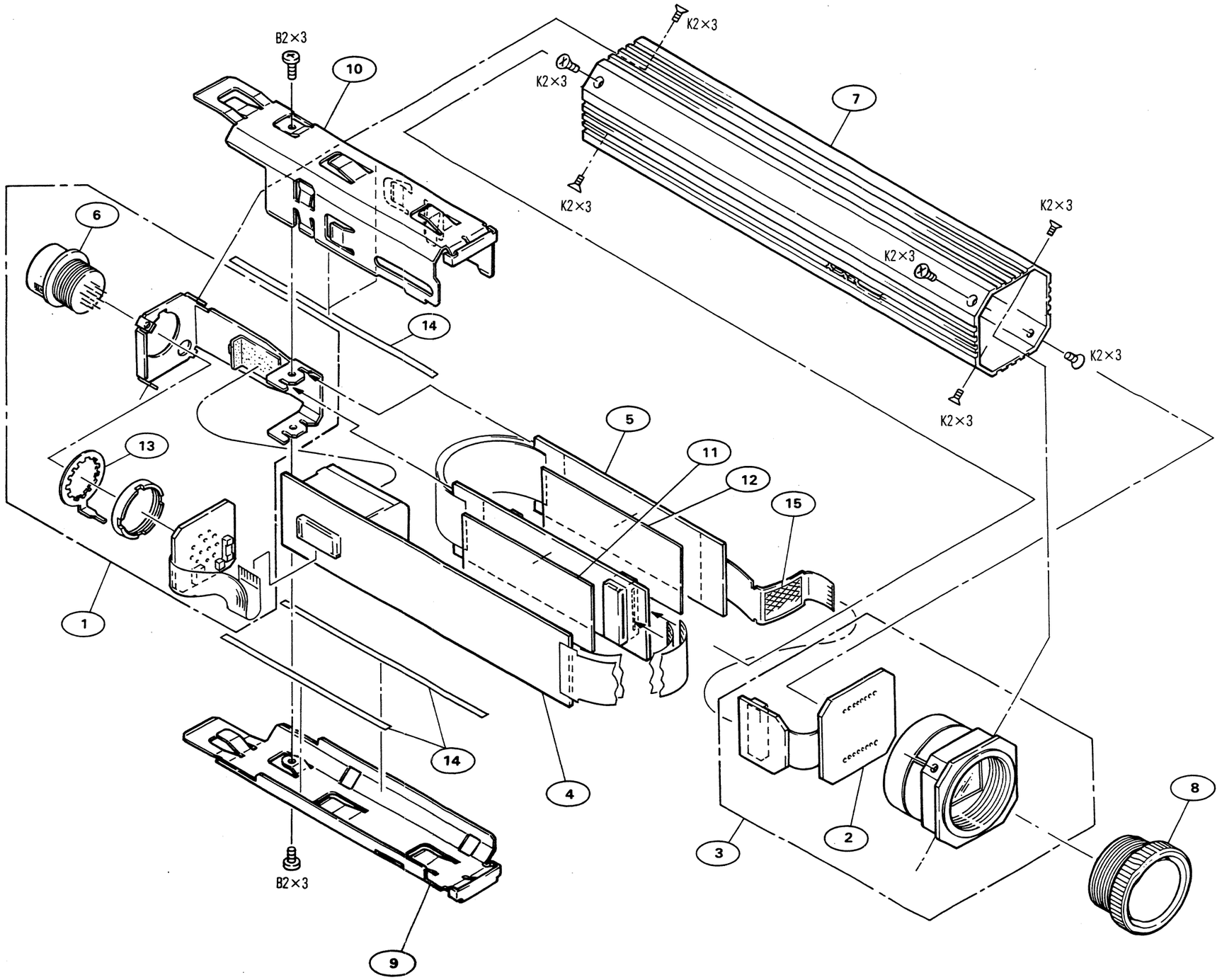
| No. | Part No. | SP | Description |
|---|---|---|---|
| 1 | 3-708-308-01 | o | CAP, LENS FRONT |
| 2 | 3-708-309-01 | o | CAP, LENS REAR |
| 3 | 3-708-511-01 | o | CAP, LENS FRONT |
| 4 | 3-708-615-01 | o | CAP, LENS FRONT |




XC-999 (UCJ)
XC-999P (E K)
CMA-999 (UCJ)
CMA-999 (EK)

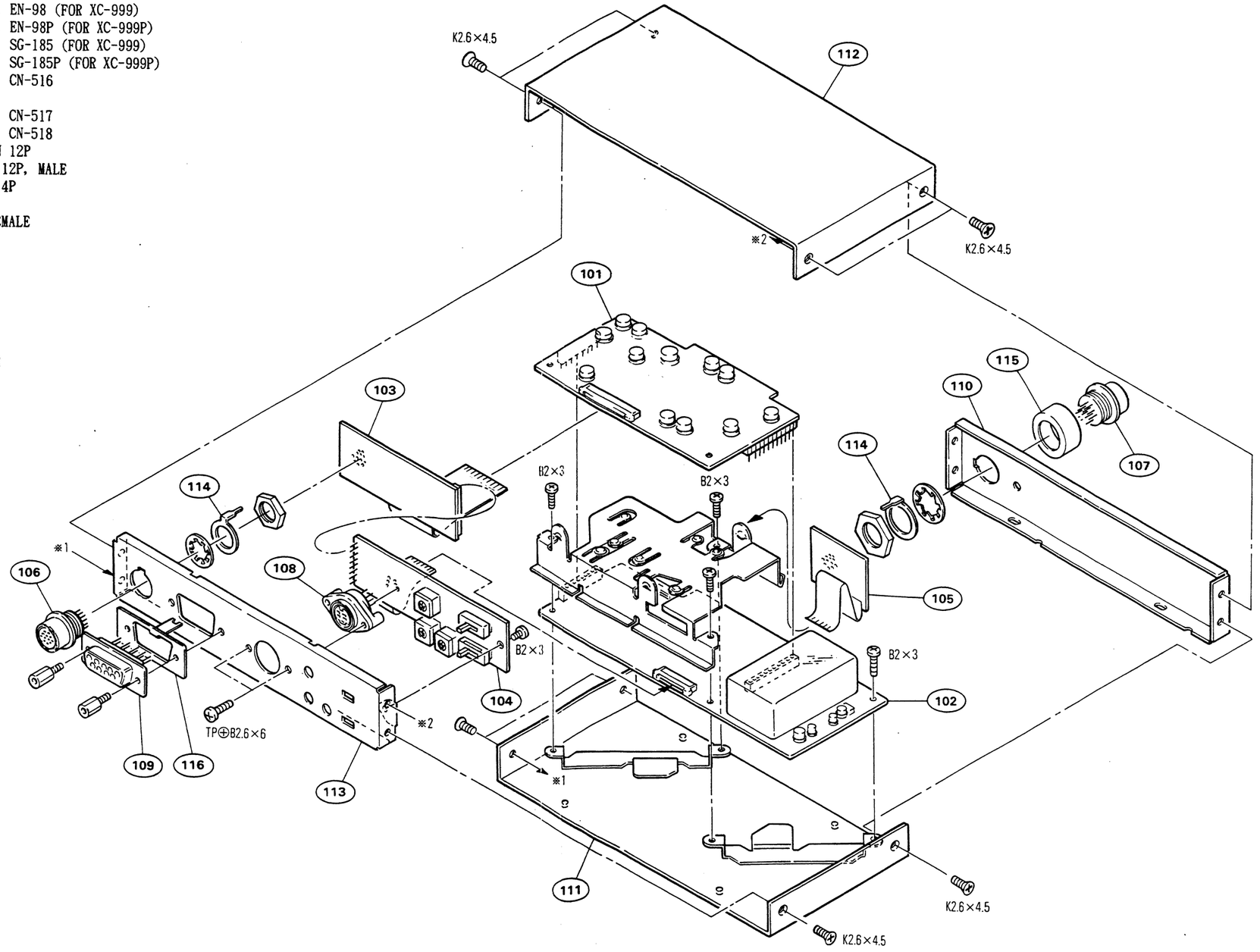
## D-3. XC-999/999P EXPLODED VIEW

| No. | Part No. | SP | Description |
|---|---|---|---|
| 1 | A-7420-212-A | o | REAR BLOCK ASSY |
| 2 | A-7520-582-A | o | MOUNTED CIRCUIT BOARD, CD-39 |
| 3 | A-7575-190-A | s | CCD UNIT-XC999 (FOR XC-999) |
| | A-7575-191-A | s | CCD UNIT-XC999P (FOR XC-999P) |
| 4 | A-7615-269-A | s | EN-97 ASSY (FOR XC-999) |
| | A-7615-270-A | s | EN-97P ASSY (FOR XC-999P) |
| 5 | A-7615-271-A | s | TG-PR ASSY (FOR XC-999) |
| | A-7615-272-A | s | TG-PR ASSY (FOR XC-999P) |
| 6 | 1-691-410-21 | s | CONNECTOR, ROUND TYPE 12P |
| 7 | 3-173-507-01 | o | COVER, CAMERA |
| 8 | 3-173-508-01 | s | CAP (SPECIAL MT), LENS MOUNT |
| 9 | 3-173-510-01 | o | CASE (D), INNER |
| 10 | 3-173-511-01 | o | CASE (U), INNER |
| 11 | 3-174-225-01 | s | SHETT, RADIATION |
| 12 | 3-174-225-11 | s | SHEET, RADIATION |
| 13 | 3-718-804-01 | o | LUG, GROUND |
| 14 | 3-175-675-11 | s | SHEET, INSULATING |
| 15 | 3-185-784-01 | s | SHEET, COPPER LEAF |



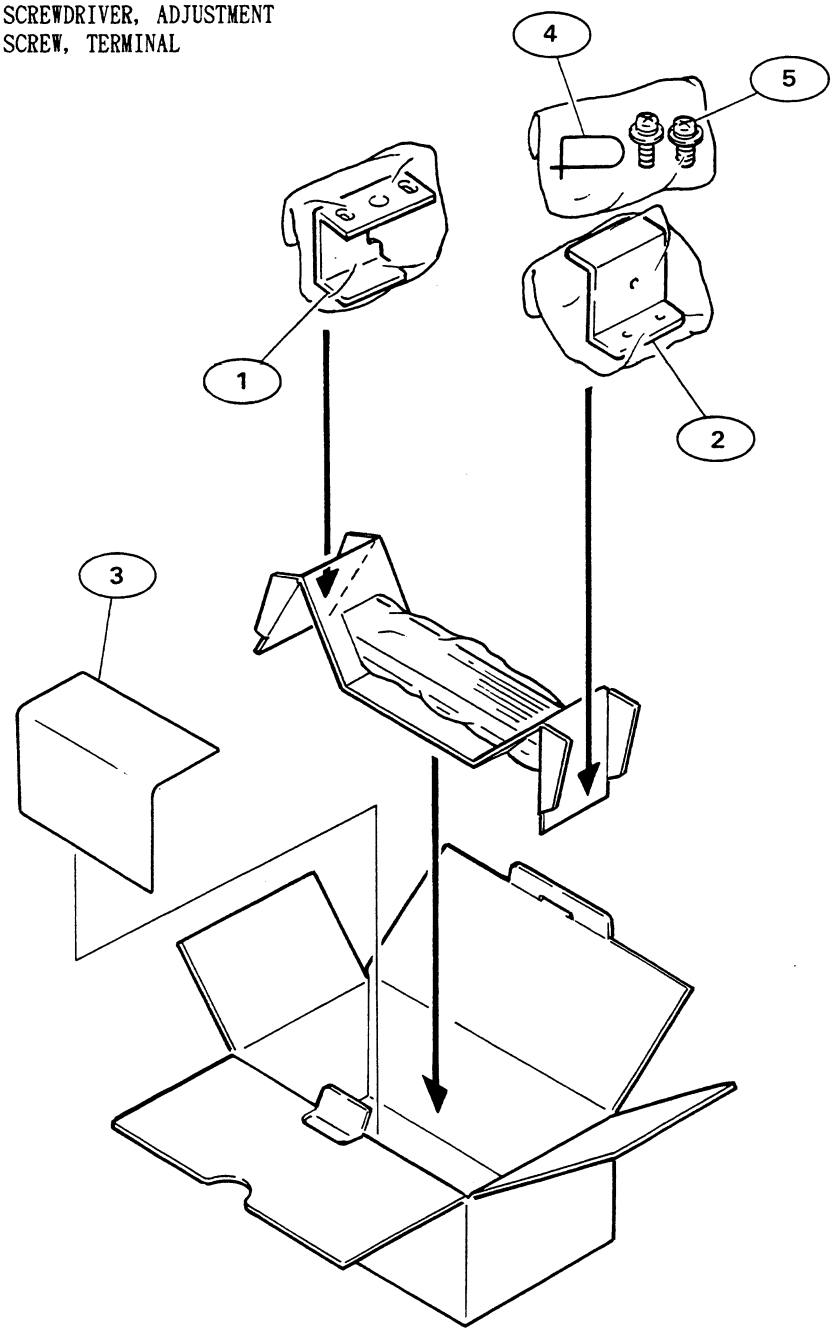
## D-4. CMA-999/999P EXPLODED VIEW

| No. | Part No. | SP | Description |
|---|---|---|---|
| 101 | A-7515-394-A | o | MOUNTED CIRCUIT BOARD, EN-98 (FOR XC-999) |
| | A-7515-395-A | o | MOUNTED CIRCUIT BOARD, EN-98P (FOR XC-999P) |
| 102 | A-7515-396-A | o | MOUNTED CIRCUIT BOARD, SG-185 (FOR XC-999) |
| | A-7515-397-A | o | MOUNTED CIRCUIT BOARD, SG-185P (FOR XC-999P) |
| 103 | A-7520-583-A | s | MOUNTED CIRCUIT BOARD, CN-516 |
| 104 | A-7520-584-A | o | MOUNTED CIRCUIT BOARD, CN-517 |
| 105 | A-7520-585-A | o | MOUNTED CIRCUIT BOARD, CN-518 |
| 106 | 1-562-221-31 | s | RECEPTACLE, CONNECTION 12P |
| 107 | 1-562-381-00 | s | CONNECTOR, ROUND TYPE 12P, MALE |
| 108 | 1-565-301-11 | s | CONNECTOR, ROUND TYPE 4P |
| 109 | 1-580-090-11 | s | D-SUB CONNECTOR 9P, FEMALE |
| 110 | 3-173-517-01 | o | PANEL, REAR |
| 111 | 3-173-519-01 | o | CASE, LOWER |
| 112 | X-4620-649-1 | o | CASE ASSY, UPPER |
| 113 | 3-173-522-01 | o | PANEL, FRONT |
| 114 | 3-718-804-01 | o | LUG, GROUND |
| 115 | 3-718-852-01 | o | GUIDE (2), CONNECTOR |
| 116 | 3-737-536-01 | o | LUG, GROUND, CONNECTOR |

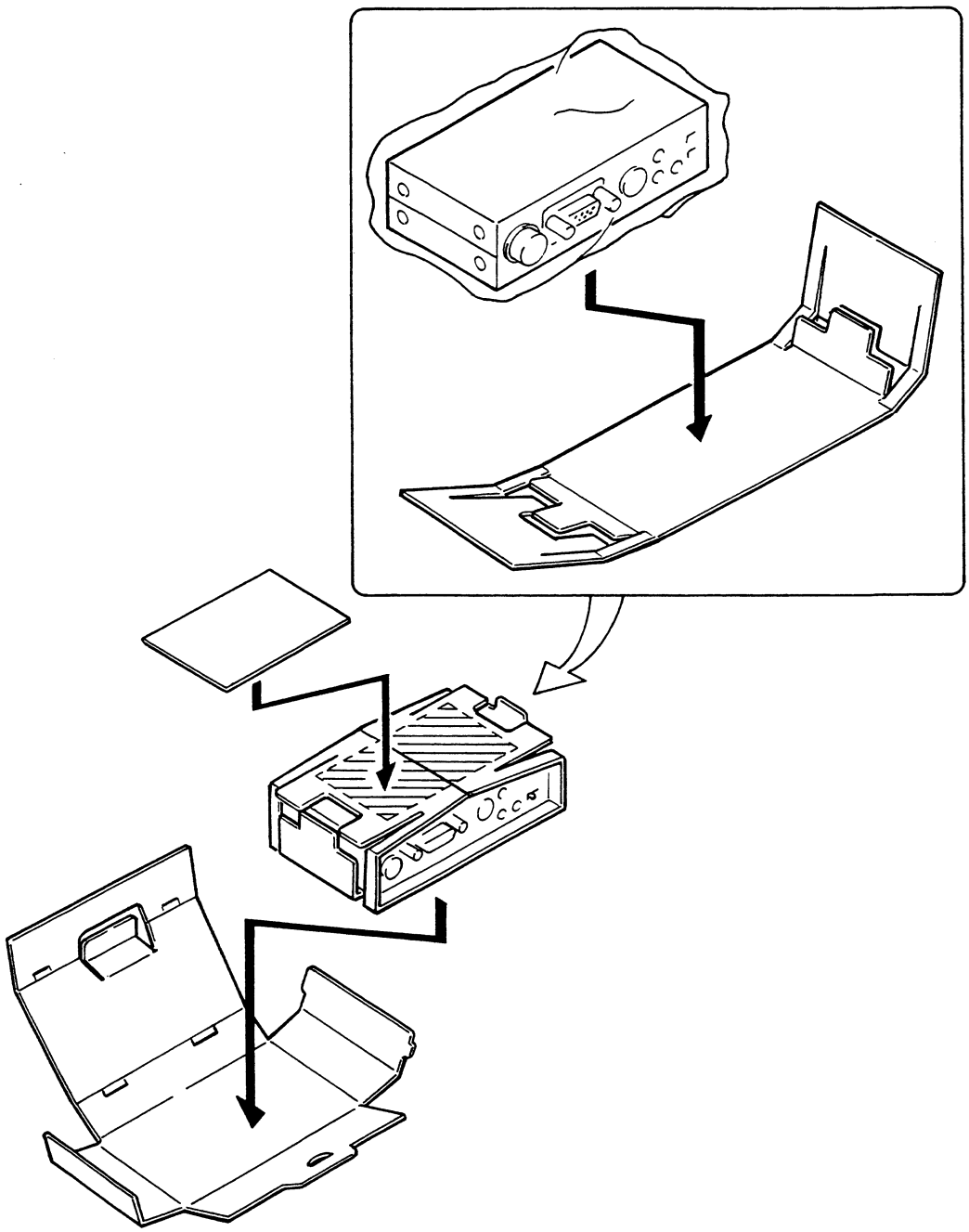


## D-5. XC-999/999P PACKING MATERIAL

| No. | Part No. | SP | Description |
|---|---|---|---|
| 1 | X-3166-471-1 | o | CAMERA HOLDER (A) ASSY |
| 2 | X-3166-472-1 | o | CAMERA HOLDER (B) ASSY |
| 3 | 3-754-157-14 | s | MANUAL, INSTRUCTION |
| 4 | 3-174-631-01 | s | SCREWDRIVER, ADJUSTMENT |
| 5 | 3-174-632-01 | s | SCREW, TERMINAL |



## D-6. CMA-999/999P PACKING MATERIAL



D-7. XC-999/999P ELECTRICAL PARTS LIST

---
CD-39 BOARD
---

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| 1pc | A-7520-582-A | o | MOUNTED CIRCUIT BOARD, CD-39 |
| C1 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C2 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C5 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C6 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3 |
| C7 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C8 | 1-135-154-21 | s | TANTALUM, CHIP 3.3uF 20% 20V |
| C9 | 1-135-154-21 | s | TANTALUM, CHIP 3.3uF 20% 20V |
| JR2 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W |
| Q1 | 8-765-420-02 | s | TRANSISTOR 2SK300-3 |
| R2 | 1-218-970-11 | s | METAL 27K 5% 1/16W |
| R3 | 1-218-980-11 | s | METAL 180K 5% 1/16W |
| R4 | 1-218-941-11 | s | METAL 100 5% 1/16W |
| R5 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |

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CN-519 BOARD
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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C1 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C2 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C3 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C4 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C5 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C6 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C7 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C8 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C9 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C10 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C11 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C12 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| C13 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V |
| D1 | 8-719-510-11 | s | DIODE D1FS4 |
| F1 | ⚠ 1-576-220-21 | s | FUSE, CHIP 0.8A 125V |
| L1 | 1-412-026-11 | s | INDUCTOR CHIP 1uH |
| L2 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L3 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L4 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L5 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L6 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L7 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |

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EN-97/97P BOARD
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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C602 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C603 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C604 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C605 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C606 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C607 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C608 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C609 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C610 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C611 | 1-137-323-11 | s | FILM 0.01uF 5% 16V |
| C613 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C614 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C615 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C616 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C617 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C618 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C619 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C620 | 1-164-874-11 | s | CERAMIC 100PF 5% 16V |
| C621 | 1-135-198-11 | s | TANTAL 1.5uF 20% 20V |
| C622 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C623 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C624 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C625 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C626 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C627 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C628 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C629 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C630 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C631 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C632 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C633 | 1-135-229-11 | s | TANTAL 6.8uF 20% 6.3V |
| C634 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C635 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C636 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C637 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C639 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C640 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C641 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C642 | 1-135-198-11 | s | TANTAL 1.5uF 20% 20V |
| C643 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C644 | 1-135-237-11 | s | TANTAL 2.2uF 20% 16V |
| C645 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C646 | 1-135-239-11 | s | TANTAL 10uF 20% 10V |
| C647 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C648 | 1-135-325-11 | s | TANTAL 4.7uF 20% 20V |
| C650 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C651 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C652 | 1-163-275-11 | s | CERAMIC 0.001uF 5% 50V |
| C654 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3 |
| C656 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C657 | 1-164-315-11 | s | CERAMIC 470PF 5% 50V |
| C658 | 1-162-969-11 | s | CERAMIC 0.0068uF 10% 25V |
| C659 | 1-135-199-21 | s | TANTAL 1uF 10% 16V |
| C660 | 1-163-275-11 | s | CERAMIC 0.001uF 5% 50V |
| C661 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |

(EN-97/97P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C662 | 1-135-199-21 | s | TANTAL 1uF 10% 16V |
| C663 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C664 | 1-135-247-11 | s | TANTAL 47uF 20% 6.3V |
| C665 | 1-164-315-11 | s | CERAMIC 470PF 5% 50V |
| C666 | 1-135-234-11 | s | TANTAL 10uF 20% 4V |
| C667 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C668 | 1-135-246-11 | s | TANTAL 33uF 20% 6.3V |
| C669 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| D601 | 8-719-105-91 | s | DIODE RD5.6M-B2 |
| D602 | 8-719-404-40 | s | DIODE MA121 |
| D603 | 8-719-404-40 | s | DIODE MA121 |
| D604 | 8-719-820-05 | s | DIODE 1SS181 |
| IC602 | 8-759-038-46 | s | IC SC7S00F |
| IC603 | 8-759-925-90 | s | IC SN74HC74ANS |
| IC604 | 8-759-038-46 | s | IC SC7S00F |
| IC605 | 8-759-711-50 | s | IC NJU7022M |
| IC606 | 8-759-509-13 | s | IC XRU4052BF |
| IC607 | 8-759-038-46 | s | IC SC7S00F |
| IC609 | 8-759-106-89 | s | IC UPD74HC157G |
| IC610 | 8-759-509-17 | s | IC XRU4053BF |
| IC611 | 8-759-981-65 | s | IC NJM2903M |
| IC612 | 8-759-053-34 | s | IC UPD74HC4053G |
| IC613 | 8-759-053-34 | s | IC UPD74HC4053G |
| IC614 | 8-759-057-43 | s | IC MC14576BF |
| IC615 | 8-759-057-43 | s | IC MC14576BF |
| IC616 | 8-759-234-13 | s | IC TC4S30F |
| IC617 | 8-759-038-46 | s | IC SC7S00F |
| IC618 | 8-759-038-46 | s | IC SC7S00F |
| IC619 | 8-759-038-46 | s | IC SC7S00F |
| IC620 | 8-759-038-46 | s | IC SC7S00F |
| IC621 | 8-759-038-46 | s | IC SC7S00F |
| IC622 | 8-759-038-46 | s | IC SC7S00F |
| IC623 | 8-759-710-82 | s | IC NJM2406F |
| IC624 | 8-759-711-50 | s | IC NJU7022M |
| IC625 | 8-759-111-51 | s | IC UPD5555G |
| IC626 | 8-759-038-46 | s | IC SC7S00F |
| IC627 | 8-759-234-13 | s | IC TC4S30F |
| IC628 | 8-759-038-46 | s | IC SC7S00F |
| IC629 | 8-759-038-46 | s | IC SC7S00F |
| IC630 | 8-759-038-46 | s | IC SC7S00F |
| IC631 | 8-759-038-46 | s | IC SC7S00F |
| IC632 | 8-759-038-46 | s | IC SC7S00F |
| IC633 | 8-759-038-46 | s | IC SC7S00F |
| IC634 | 8-759-142-20 | s | IC UPC4062G2 |
| IC635 | 8-759-035-93 | s | IC TC7S32F |
| IC636 | 8-759-031-84 | s | IC SC7S04F |
| IC637 | 8-759-234-20 | s | IC TC7S08F |
| IC638 | 8-759-234-77 | s | IC TC4S66F |
| JR601 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999] |
| JR602 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999P] |
| L601 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L602 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L603 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L604 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L605 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |

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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| L606 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L607 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L608 | 1-412-028-11 | s | INDUCTOR, CHIP 4.7uH |
| PU601 | 1-466-634-11 | s | CONVERTER UNIT, DC-DC |
| Q601 | 8-729-429-67 | s | TRANSISTOR 2SA1791-Q |
| Q602 | 8-729-429-67 | s | TRANSISTOR 2SA1791-Q |
| Q603 | 8-729-429-67 | s | TRANSISTOR 2SA1791-Q |
| Q604 | 8-729-429-63 | s | TRANSISTOR 2SC4656-Q |
| Q605 | 8-729-429-67 | s | TRANSISTOR 2SA1791-Q |
| Q606 | 8-729-429-67 | s | TRANSISTOR 2SA1791-Q |
| Q607 | 8-729-429-67 | s | TRANSISTOR 2SA1791-Q |
| Q609 | 8-729-429-63 | s | TRANSISTOR 2SC4656-Q |
| Q610 | 8-729-429-63 | s | TRANSISTOR 2SC4656-Q |
| Q611 | 8-729-429-63 | s | TRANSISTOR 2SC4656-Q |
| Q612 | 8-729-429-63 | s | TRANSISTOR 2SC4656-Q |
| R601 | 1-218-972-11 | s | METAL 39K 5% 1/16W |
| R602 | 1-218-947-11 | s | METAL 330 5% 1/16W [for XC-999] |
| R602 | 1-218-945-11 | s | METAL 220 5% 1/16W [for XC-999P] |
| R603 | 1-218-972-11 | s | METAL 39K 5% 1/16W |
| R604 | 1-218-973-11 | s | METAL 47K 5% 1/16W |
| R605 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R606 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R607 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R608 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R609 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R610 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R611 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R612 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R613 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R614 | 1-218-975-11 | s | METAL 68K 5% 1/16W |
| R615 | 1-218-981-11 | s | METAL 220K 5% 1/16W |
| R616 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R617 | 1-218-976-11 | s | METAL 82K 5% 1/16W |
| R618 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R619 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R620 | 1-218-975-11 | s | METAL 68K 5% 1/16W |
| R621 | 1-218-981-11 | s | METAL 220K 5% 1/16W |
| R622 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R623 | 1-218-981-11 | s | METAL 220K 5% 1/16W |
| R624 | 1-218-962-11 | s | METAL 5.6K 5% 1/16W |
| R625 | 1-218-947-11 | s | METAL 330 5% 1/16W |
| R626 | 1-218-960-11 | s | METAL 3.9K 5% 1/16W |
| R627 | 1-218-954-11 | s | METAL 1.2K 5% 1/16W |
| R628 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R629 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R630 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R631 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R632 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R633 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R634 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R635 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R636 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R637 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R638 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R639 | 1-218-953-11 | s | METAL 1K 5% 1/16W |

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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R640 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R644 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R645 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R646 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R647 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R648 | 1-218-973-11 | s | METAL 47K 5% 1/16W |
| R649 | 1-218-975-11 | s | METAL 68K 5% 1/16W |
| R650 | 1-218-975-11 | s | METAL 68K 5% 1/16W |
| R651 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R652 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R653 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R655 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R656 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R657 | 1-218-941-11 | s | METAL 100 5% 1/16W |
| R658 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R659 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R660 | 1-218-964-11 | s | METAL 8.2K 5% 1/16W |
| R661 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R662 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R663 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R664 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R665 | 1-218-980-11 | s | METAL 180K 5% 1/16W |
| R666 | 1-218-941-11 | s | METAL 100 5% 1/16W |
| R667 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R668 | 1-218-976-11 | s | METAL 82K 5% 1/16W |
| R669 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R670 | 1-218-975-11 | s | METAL 68K 5% 1/16W |
| R671 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R672 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R673 | 1-218-974-11 | s | METAL 56K 5% 1/16W |
| R674 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R675 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R676 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| RV601 | 1-241-741-11 | s | RES, ADJ CERMET 50K |
| RV602 | 1-241-741-11 | s | RES, ADJ CERMET 50K |
| RV603 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV604 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV605 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV606 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV607 | 1-241-604-11 | s | RES, ADJ CERMET 220 |
| RV608 | 1-241-609-11 | s | RES, ADJ CERMET 10K |
| S601 | 1-572-971-21 | s | SWITCH, SLIDE |

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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C301 | 1-163-237-11 | s | CERAMIC 27PF 5% 50V |
| C302 | 1-162-923-11 | s | CERAMIC, CHIP 47PF 5% 50V |
| C303 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C304 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C305 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C306 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C307 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C308 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C309 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C310 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C311 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C312 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C313 | 1-135-324-11 | s | TANTAL 1uF 20% 20V |
| C314 | 1-135-324-11 | s | TANTAL 1uF 20% 20V |
| C315 | 1-135-324-11 | s | TANTAL 1uF 20% 20V |
| C316 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C317 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C318 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3 |
| C319 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C320 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C321 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C322 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C323 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C324 | 1-135-324-11 | s | TANTAL 1uF 20% 20V |
| C325 | 1-135-324-11 | s | TANTAL 1uF 20% 20V |
| C326 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C327 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C328 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C329 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C330 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C331 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C332 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C333 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C334 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C335 | 1-135-324-11 | s | TANTAL 1uF 20% 20V |
| C336 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C337 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C338 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C339 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C340 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C341 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C342 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C343 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C344 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C345 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C346 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C347 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C348 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C349 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C350 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C351 | 1-163-038-00 | s | CERAMIC, CHIP 0.1uF 25V |
| C352 | 1-164-232-11 | s | CERAMIC, CHIP 0.01uF 10% 50V |
| C353 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C354 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C355 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C356 | 1-164-850-11 | s | CERAMIC 10PF 0.5PF 16V [for XC-999] |
| C357 | 1-164-858-11 | s | CERAMIC 22PF 5% 16V [for XC-999] |

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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C358 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3 V [for XC-999] |
| C359 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3 V [for XC-999] |
| C360 | 1-135-324-11 | s | TANTAL 1uF 20% 20V [for XC-999] |
| C361 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V [for XC-999] |
| C362 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V [for XC-999] |
| C363 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V [for XC-999] |
| C364 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V [for XC-999] |
| C365 | 1-164-156-11 | s | CERAMIC 0.1uF 25V [for XC-999] |
| C366 | 1-163-235-11 | s | CERAMIC, CHIP 22PF 5% 50V [for XC-999] |
| C367 | 1-164-346-11 | s | CERAMIC 1uF 16V |
| C368 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C369 | 1-164-346-11 | s | CERAMIC 1uF 16V |
| C370 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C371 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C372 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C373 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C374 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C375 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C376 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C377 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C378 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C379 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C380 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C381 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C382 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| D301 | 8-719-404-40 | s | DIODE MA121 |
| FL301 | 1-415-860-21 | s | DELAY LINE, LC |
| FL302 | 1-415-818-31 | s | DELAY LINE, LC (Y) |
| FL303 | 1-236-758-21 | s | FILTER, LOW PASS (Y.DL) [for XC-999] |
| FL303 | 1-236-892-21 | s | FILTER, LOW PASS [for XC-999P] |
| FL304 | 1-415-763-31 | s | DELAY LINE, LC |
| FL305 | 1-415-607-21 | s | DELAY LINE, LC |
| FL306 | 1-415-763-31 | s | DELAY LINE, LC |
| FL307 | 1-236-758-21 | s | FILTER, LOW PASS (Y.DL) [for XC-999] |
| FL308 | 1-239-212-31 | s | FILTER, BAND PASS [for XC-999] |
| FL308 | 1-239-211-31 | s | FILTER, BAND PASS [for XC-999P] |
| IC301 | 8-752-333-26 | s | IC CXL1507N |
| IC302 | 8-752-038-97 | s | IC CXA1391R |
| IC303 | 8-752-332-69 | s | IC CXL5504M |
| IC304 | 8-752-038-99 | s | IC CXA1392R |
| IC305 | 8-752-332-69 | s | IC CXL5504M [for XC-999] |
| IC306 | 8-759-711-50 | s | IC NJU7022M |
| JR301 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W |
| L301 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L302 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L303 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L304 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L305 | 1-412-011-31 | s | INDUCTOR CHIP 27uH [for XC-999] |
| L306 | 1-410-204-31 | s | INDUCTOR CHIP 10uH [for XC-999] |
| Q301 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q302 | 8-729-403-27 | s | TRANSISTOR XN4401 |
| Q303 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q304 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |

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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| Q305 | 8-729-402-84 | s | TRANSISTOR XN4601 |
| Q306 | 8-729-905-23 | s | TRANSISTOR 2SA1576R [for XC-999] |
| Q307 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for XC-999] |
| Q308 | 8-729-402-81 | s | TRANSISTOR XN4501 [for XC-999] |
| Q309 | 8-729-402-81 | s | TRANSISTOR XN4501 [for XC-999] |
| Q310 | 8-729-402-84 | s | TRANSISTOR XN4601 |
| R311 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R312 | 1-218-955-11 | s | METAL 1.5K 5% 1/16W |
| R313 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R314 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R315 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R316 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R317 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R318 | 1-218-968-11 | s | METAL 18K 5% 1/16W |
| R319 | 1-218-968-11 | s | METAL 18K 5% 1/16W |
| R320 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R321 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R322 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R323 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R324 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R325 | 1-218-972-11 | s | METAL 39K 5% 1/16W |
| R326 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R327 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R328 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R329 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R330 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R331 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R332 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R333 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R334 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R335 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R336 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R337 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R338 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R339 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R340 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R341 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R342 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R343 | 1-218-968-11 | s | METAL 18K 5% 1/16W |
| R344 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R345 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R346 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R347 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R348 | 1-218-967-11 | s | METAL 15K 5% 1/16W [for XC-999] |
| R348 | 1-218-966-11 | s | METAL 12K 5% 1/16W [for XC-999P] |
| R349 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R350 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R351 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999] |
| R356 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999] |
| R357 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R358 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R359 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999] |
| R360 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R361 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R362 | 1-218-969-11 | s | METAL 22K 5% 1/16W |

(PR-153/153P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R363 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R364 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R365 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R366 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999] |
| R367 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R368 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999] |
| R369 | 1-218-967-11 | s | METAL 15K 5% 1/16W [for XC-999] |
| R370 | 1-218-941-11 | s | METAL 100 5% 1/16W [for XC-999] |
| R371 | 1-218-951-11 | s | METAL 680 5% 1/16W [for XC-999] |
| R372 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R373 | 1-218-989-11 | s | METAL 1M 5% 1/16W [for XC-999] |
| R374 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R375 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999] |
| R376 | 1-218-967-11 | s | METAL 15K 5% 1/16W [for XC-999] |
| R377 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999] |
| R378 | 1-218-967-11 | s | METAL 15K 5% 1/16W [for XC-999] |
| R379 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R380 | 1-218-951-11 | s | METAL 680 5% 1/16W [for XC-999] |
| R381 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R382 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999] |
| R383 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R384 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R385 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R386 | 1-218-960-11 | s | METAL 3.9K 5% 1/16W [for XC-999] |
| R387 | 1-218-951-11 | s | METAL 680 5% 1/16W [for XC-999] |
| R388 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R389 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R390 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R391 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R392 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R393 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R394 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R395 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R396 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R397 | 1-218-974-11 | s | METAL 56K 5% 1/16W |
| R398 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R399 | 1-218-974-11 | s | METAL 56K 5% 1/16W |
| R400 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R401 | 1-218-954-11 | s | METAL 1.2K 5% 1/16W |
| R402 | 1-218-954-11 | s | METAL 1.2K 5% 1/16W |
| R403 | 1-218-954-11 | s | METAL 1.2K 5% 1/16W |
| R404 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999P] |
| R405 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999P] |
| R406 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999P] |
| R407 | 1-218-953-11 | s | METAL 1K 5% 1/16W [for XC-999P] |
| RV301 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV302 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV303 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV304 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV305 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV306 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV307 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV308 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV309 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV310 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV311 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV312 | 1-241-611-11 | s | RES, ADJ CERMET 47K |

(PR-153/153P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| RV313 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV314 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV315 | 1-241-605-11 | s | RES, ADJ CERMET 470 [for XC-999] |
| RV316 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV317 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV318 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV319 | 1-241-612-11 | s | RES, ADJ CERMET 100K |
| RV320 | 1-241-612-11 | s | RES, ADJ CERMET 100K |

TG-89/89P BOARD

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C1 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C2 | 1-135-323-11 | s | TANTAL 6.8uF 20% 35V |
| C3 | 1-135-322-11 | s | TANTAL 1.5uF 20% 35V |
| C4 | 1-164-005-11 | s | CERAMIC, CHIP 0.47uF 25V |
| C5 | 1-135-322-11 | s | TANTAL 1.5uF 20% 35V |
| C6 | 1-135-326-11 | s | TANTAL 10uF 20% 20V |
| C7 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C8 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C9 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C10 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C11 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C12 | 1-164-874-11 | s | CERAMIC 100PF 5% 16V |
| C13 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C14 | 1-164-880-11 | s | CERAMIC 180PF 5% 16V |
| C15 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C16 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C17 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C18 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C19 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C20 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C21 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C22 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C23 | 1-135-321-11 | s | TANTAL 0.47uF 20% 35V |
| C24 | 1-135-321-11 | s | TANTAL 0.47uF 20% 35V |
| C25 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C26 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C27 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C28 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C29 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C30 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C31 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C32 | 1-164-862-11 | s | CERAMIC 33PF 5% 16V |
| C33 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C34 | 1-164-346-11 | s | CERAMIC 1uF 16V |
| C35 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C36 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C37 | 1-135-247-11 | s | TANTAL 47uF 20% 6.3V |
| C38 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C39 | 1-135-241-11 | s | TANTAL 3.3uF 20% 6.3V |
| C40 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C41 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C43 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C44 | 1-135-154-21 | s | TANTALUM, CHIP 3.3uF 20% 20V |
| C45 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C46 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C47 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C50 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C51 | 1-135-243-11 | s | TANTAL 10uF 20% 6.3V |
| C52 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C53 | 1-135-248-11 | s | TANTAL 68uF 20% 6.3V |
| C54 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C55 | 1-135-246-11 | s | TANTAL 33uF 20% 6.3V |
| C56 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C57 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C58 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C59 | 1-164-937-11 | s | CERAMIC 0.001uF 10% 16V |
| C60 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C61 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |

(TG-89/89P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C62 | 1-135-193-11 | s | TANTAL 0.1uF 20% 35V |
| C63 | 1-135-198-11 | s | TANTAL 1.5uF 20% 20V |
| C64 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C65 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C66 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C67 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C68 | 1-135-246-11 | s | TANTAL 33uF 20% 6.3 |
| C69 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V |
| C70 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C71 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C72 | 1-164-852-11 | s | CERAMIC 12PF 5% 16V |
| C73 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V |
| C74 | 1-164-874-11 | s | CERAMIC 100PF 5% 16V |
| C75 | 1-164-866-11 | s | CERAMIC 47PF 5% 16V [for XC-999P] |
| C77 | 1-164-943-11 | s | CERAMIC 0.01uF 10% 16V [for XC-999P] |
| C78 | 1-164-156-11 | s | CERAMIC 0.1uF 25V [for XC-999P] |
| C79 | 1-135-198-11 | s | TANTAL 1.5uF 20% 20V [for XC-999P] |
| C80 | 1-135-195-21 | s | TANTAL 0.47uF 10% 25V [for XC-999P] |
| C81 | 1-135-246-11 | s | TANTAL 33uF 20% 6.3 [for XC-999P] |
| C82 | 1-164-862-11 | s | CERAMIC 33PF 5% 16V |
| C85 | 1-164-846-11 | s | CERAMIC 6PF 0.5PF 16V [for XC-999P] |
| CT1 | 1-141-325-11 | s | CAP, TRIMMER 5PF |
| CT2 | 1-141-327-11 | s | CAP, TRIMMER 10PF [for XC-999P] |
| D1 | 8-719-800-76 | s | DIODE 1SS226 |
| D2 | 8-719-820-05 | s | DIODE 1SS181 |
| D3 | 8-719-820-05 | s | DIODE 1SS181 |
| D5 | 8-719-988-37 | s | DIODE HVU350F |
| D6 | 8-719-988-37 | s | DIODE HVU350F [for XC-999P] |
| IC1 | 8-752-327-48 | s | IC CXD1250N |
| IC2 | 8-752-054-61 | s | IC CXA1390AR |
| IC3 | 8-752-335-49 | s | IC CXD1252AR |
| IC4 | 8-752-335-47 | s | IC CXD1216M |
| IC5 | 8-752-332-67 | s | IC CXD1217M |
| IC6 | 8-759-234-77 | s | IC TC4S66F |
| IC7 | 8-759-234-77 | s | IC TC4S66F |
| IC8 | 8-759-209-90 | s | IC TC4S71F |
| IC9 | 8-759-234-13 | s | IC TC4S30F |
| IC10 | 8-759-031-84 | s | IC SC7S04F |
| L1 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L2 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L3 | 1-412-029-11 | s | INDUCTOR CHIP 10uH |
| L4 | 1-412-006-31 | s | INDUCTOR, CHIP 10uH |
| Q1 | 8-729-402-13 | s | TRANSISTOR XN1501 |
| Q2 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q3 | 8-729-403-42 | s | TRANSISTOR XN1401 |
| Q4 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q5 | 8-729-402-84 | s | TRANSISTOR XN4601 |
| Q6 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q7 | 8-729-402-84 | s | TRANSISTOR XN4601 |
| Q8 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q9 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q10 | 8-729-402-42 | s | TRANSISTOR UN5213 [for XC-999P] |
| Q11 | 8-729-402-84 | s | TRANSISTOR XN4601 [for XC-999P] |
| R1 | 1-218-969-11 | s | METAL 22K 5% 1/16W |

(TG-89/89P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R2 | 1-218-982-11 | s | METAL 270K 5% 1/16W |
| R3 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R4 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R5 | 1-218-975-11 | s | METAL 68K 5% 1/16W |
| R6 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R7 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R8 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R9 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R10 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W |
| R11 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R12 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R13 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R14 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R15 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R16 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R17 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R18 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R19 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R20 | 1-218-959-11 | s | METAL 3.3K 5% 1/16W |
| R21 | 1-218-959-11 | s | METAL 3.3K 5% 1/16W |
| R22 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R23 | 1-218-972-11 | s | METAL 39K 5% 1/16W |
| R24 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R25 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R26 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R27 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R28 | 1-218-970-11 | s | METAL 27K 5% 1/16W |
| R29 | 1-218-966-11 | s | METAL 12K 5% 1/16W |
| R30 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R31 | 1-218-945-11 | s | METAL 220 5% 1/16W |
| R32 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R33 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R34 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R35 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R36 | 1-218-968-11 | s | METAL 18K 5% 1/16W |
| R37 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R38 | 1-218-966-11 | s | METAL 12K 5% 1/16W |
| R39 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R40 | 1-218-970-11 | s | METAL 27K 5% 1/16W |
| R41 | 1-218-970-11 | s | METAL 27K 5% 1/16W |
| R42 | 1-218-972-11 | s | METAL 39K 5% 1/16W |
| R44 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R45 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R46 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R47 | 1-218-989-11 | s | METAL 1M 5% 1/16W |
| R48 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999] |
| R49 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R50 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R51 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999] |
| R52 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W |
| R53 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R54 | 1-218-977-11 | s | METAL 100K 5% 1/16W |
| R55 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R56 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R57 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R58 | 1-218-971-11 | s | METAL 33K 5% 1/16W |
| R59 | 1-218-953-11 | s | METAL 1K 5% 1/16W |

(TG-89/89P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R60 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W |
| R61 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W |
| R62 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W |
| R63 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R64 | 1-218-969-11 | s | METAL 22K 5% 1/16W |
| R65 | 1-218-961-11 | s | METAL 4.7K 5% 1/16W |
| R66 | 1-218-967-11 | s | METAL 15K 5% 1/16W |
| R67 | 1-218-954-11 | s | METAL 1.2K 5% 1/16W |
| R68 | 1-218-965-11 | s | METAL 10K 5% 1/16W |
| R69 | 1-218-953-11 | s | METAL 1K 5% 1/16W |
| R70 | 1-218-947-11 | s | METAL 330 5% 1/16W |
| R71 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999P] |
| R72 | 1-218-959-11 | s | METAL 3.3K 5% 1/16W [for XC-999P] |
| R73 | 1-218-957-11 | s | METAL 2.2K 5% 1/16W [for XC-999P] |
| R74 | 1-218-941-11 | s | METAL 100 5% 1/16W [for XC-999P] |
| R75 | 1-218-989-11 | s | METAL 1M 5% 1/16W [for XC-999P] |
| R76 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999P] |
| R77 | 1-218-977-11 | s | METAL 100K 5% 1/16W [for XC-999P] |
| R78 | 1-218-977-11 | s | METAL 100K 5% 1/16W [for XC-999P] |
| R79 | 1-218-969-11 | s | METAL 22K 5% 1/16W [for XC-999P] |
| R80 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999P] |
| R81 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999P] |
| R82 | 1-218-973-11 | s | METAL 47K 5% 1/16W [for XC-999P] |
| R83 | 1-218-973-11 | s | METAL 47K 5% 1/16W [for XC-999P] |
| R84 | 1-218-965-11 | s | METAL 10K 5% 1/16W [for XC-999P] |
| R85 | 1-218-990-11 | s | METAL GLAZE 0 5% 1/16W [for XC-999P] |
| RV1 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV2 | 1-241-610-11 | s | RES, ADJ CERMET 22K |
| RV3 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| RV4 | 1-241-609-11 | s | RES, ADJ CERMET 10K |
| RV5 | 1-241-611-11 | s | RES, ADJ CERMET 47K |
| X1 | 1-579-520-21 | s | CRYSTAL 28.6363MHz [for XC-999] |
| X1 | 1-579-522-21 | s | CRYSTAL 28.375MHz [for XC-999P] |
| X2 | 1-579-521-21 | s | CRYSTAL 17.734475MHz [for XC-999P] |

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FRAME
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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| CN302 | 1-691-410-21 | s | CONNECTOR, 12P MALE |
| | 1-547-381-12 | s | FILTER BLOCK, OPTICAL |

D-8. CMA-999/999P ELECTRICAL PARTS LIST

CN-516 BOARD

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| 1pc | A-7520-583-A | o | MOUNTED CIRCUIT BOARD, CN-516 |
| 1pc | 1-690-430-11 | s | CABLE, FLAT (1.0MM PITCH) 19P |
| C1 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C2 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C3 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C4 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C5 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C6 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C7 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| CN2 | 1-691-202-11 | s | HEADER, MICRO COMPUTER 10P |
| JR1 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W |
| JR2 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W |
| JR3 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W |
| JR4 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W |
| L1 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L2 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L3 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L4 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L5 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L6 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L7 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |

CN-517 BOARD

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| 1pc | A-7520-584-A | o | MOUNTED CIRCUIT BOARD, CN-517 |
| 1pc | 1-690-429-11 | s | CABLE, FLAT (1.0MM PITCH) 11P |
| C1 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C2 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C3 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C4 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| L1 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L2 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| R1 | 1-216-826-11 | s | METAL, CHIP 2.7K 5% 1/16W |
| R2 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R3 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| RV1 | 1-237-517-21 | s | RES, ADJ, METAL 5K |
| RV2 | 1-237-519-21 | s | RES, ADJ, METAL 20K |
| RV3 | 1-237-518-21 | s | RES, ADJ, METAL 10K |
| S1 | 1-570-863-11 | s | SWITCH, SLIDE |
| S2 | 1-570-863-11 | s | SWITCH, SLIDE |

CN-518 BOARD

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| 1pc | A-7520-585-A | o | MOUNTED CIRCUIT BOARD, CN-518 |
| 1pc | 1-690-429-11 | s | CABLE, FLAT (1.0MM PITCH) 11P |
| C1 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C2 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C3 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C4 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| D1 | 8-719-510-11 | s | DIODE D1FS4 |
| F1 | ⚠ 1-576-220-21 | s | FUSE, CHIP 0.8A 125V |
| L1 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L2 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L3 | 1-410-995-31 | s | INDUCTOR, CHIP 1.5uH |
| L4 | 1-412-026-11 | s | INDUCTOR CHIP 1uH |
| R1 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R2 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| S1 | 1-572-972-21 | s | SWITCH, CHIP |

## EN-98/98P BOARD

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| 1pc | A-7515-394-A | o | MOUNTED CIRCUIT BOARD, EN-98 [for CMA-999] |
| 1pc | A-7515-395-A | o | MOUNTED CIRCUIT BOARD, EN-98P [for CMA-999P] |
| C1 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C2 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C9 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C10 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C17 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C27 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C28 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C29 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C32 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C33 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C34 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C35 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C36 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C37 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C53 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C54 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C55 | 1-135-091-00 | s | TANTALUN, CHIP 1uF 10% 16V |
| C56 | 1-135-091-00 | s | TANTALUN, CHIP 1uF 10% 16V |
| C57 | 1-135-091-00 | s | TANTALUN, CHIP 1uF 10% 16V |
| C58 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C59 | 1-126-607-11 | s | ELECT 47uF 20% 4V |
| C60 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C61 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C62 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C63 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C64 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C65 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C66 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C69 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C73 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C74 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C75 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C76 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C80 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C81 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C84 | 1-124-778-00 | s | ELECT 22uF 20% 6.3V |
| C85 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C88 | 1-128-004-11 | s | ELECT 10uF 20% 16V [for CMA-999] |
| C89 | 1-128-004-11 | s | ELECT 10uF 20% 16V [for CMA-999] |
| C90 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V [for CMA-999] |
| C92 | 1-128-004-11 | s | ELECT 10uF 20% 16V [for CMA-999] |
| C93 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C94 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C95 | 1-128-004-11 | s | ELECT 10uF 20% 16V [for CMA-999] |
| C96 | 1-164-156-11 | s | CERAMIC 0.1uF 25V [for CMA-999] |
| C97 | 1-128-004-11 | s | ELECT 10uF 20% 16V [for CMA-999] |
| C98 | 1-162-964-11 | s | CERAMIC 0.001uF 10% 50V [for CMA-999] |
| C99 | 1-135-091-00 | s | TANTALUN, CHIP 1uF 10% 16V [for CMA-999] |
| C102 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C103 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C110 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C111 | 1-128-004-11 | s | ELECT 10uF 20% 16V |

## (EN-98/98P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C112 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C120 | 1-126-209-11 | s | ELECT 100uF 20% 4V |
| C121 | 1-164-360-11 | s | CERAMIC 0.1uF 16V |
| C122 | 1-126-607-11 | s | ELECT 47uF 20% 4V |
| C126 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C150 | 1-135-157-21 | s | TANTALUM, CHIP 10uF 10% 6.3V |
| C151 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C152 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C153 | 1-135-157-21 | s | TANTALUM, CHIP 10uF 10% 6.3V |
| C154 | 1-135-157-21 | s | TANTALUM, CHIP 10uF 10% 6.3V |
| C155 | 1-135-157-21 | s | TANTALUM, CHIP 10uF 10% 6.3V |
| C156 | 1-162-964-11 | s | CERAMIC 0.001uF 10% 50V |
| CN1 | 1-691-193-11 | s | HEADER, MICRO (2MM PITCH) 12P |
| CN2 | 1-566-535-11 | s | CONNECTOR, FPC (ZIF) 19P |
| CN3 | 1-691-192-11 | s | HEADER, MICRO (2MM PITCH) 10P |
| D1 | 8-719-820-05 | s | DIODE 1SS181 |
| FL1 | 1-415-554-21 | s | DELAY LINE, LC |
| FL2 | 1-415-554-21 | s | DELAY LINE, LC |
| FL3 | 1-415-818-11 | s | DELAY LINE, LC (Y) [for CMA-999] |
| FL3 | 1-415-764-21 | s | DELAY LINE, LC [for CMA-999P] |
| FL4 | 1-236-758-21 | s | FILTER, LOW PASS (Y.DL) [for CMA-999] |
| FL5 | 1-236-206-11 | s | FILTER, BAND PASS [for CMA-999] |
| FL5 | 1-236-265-11 | s | FILTER, BAND PASS [for CMA-999P] |
| FL6 | 1-236-757-21 | s | FILTER, LOW PASS (C) [for CMA-999] |
| FL7 | 1-415-763-21 | s | DELAY LINE, LC [for CMA-999] |
| IC1 | 8-759-057-40 | s | IC MC14577BF |
| IC4 | 8-759-925-72 | s | IC SN74HC02ANS |
| IC7 | 8-752-034-04 | s | IC CXA1219M |
| IC8 | 8-759-057-40 | s | IC MC14577BF |
| IC9 | 8-759-057-40 | s | IC MC14577BF |
| IC10 | 8-759-057-40 | s | IC MC14577BF |
| IC11 | 8-759-057-40 | s | IC MC14577BF |
| IC12 | 8-752-332-69 | s | IC CXL5504M [for CMA-999] |
| IC13 | 8-759-057-40 | s | IC MC14577BF |
| IC20 | 8-759-242-64 | s | IC TC4W53F |
| JR1 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR2 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR5 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| L1 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L2 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L7 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L8 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L12 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L13 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L14 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L18 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L19 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L21 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L24 | 1-412-030-11 | s | INDUCTOR CHIP 22uH [for CMA-999] |
| L25 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L26 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| Q1 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q4 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |

(EN-98/98P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| Q7 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q8 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q9 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q19 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q20 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for CMA-999] |
| Q21 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for CMA-999] |
| Q22 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for CMA-999] |
| Q23 | 8-729-905-23 | s | TRANSISTOR 2SA1576R [for CMA-999] |
| Q24 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for CMA-999] |
| Q25 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for CMA-999] |
| Q26 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q30 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q31 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q32 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q33 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q34 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q35 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q36 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q37 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q38 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q39 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q40 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q41 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q42 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q43 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q44 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q48 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q51 | 8-729-403-42 | s | TRANSISTOR XN1401 |
| Q52 | 8-729-402-13 | s | TRANSISTOR XN1501 |
| Q55 | 8-729-403-42 | s | TRANSISTOR XN1401 |
| Q56 | 8-729-402-13 | s | TRANSISTOR XN1501 |
| Q59 | 8-729-403-42 | s | TRANSISTOR XN1401 |
| Q60 | 8-729-402-13 | s | TRANSISTOR XN1501 |
| Q65 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q66 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q67 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q70 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| R1 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R2 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R3 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W [for CMA-999] |
| R3 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999P] |
| R4 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R5 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R6 | 1-216-822-11 | s | METAL, CHIP 1.2K 5% 1/16W |
| R13 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R14 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R15 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W [for CMA-999] |
| R15 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999P] |
| R16 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R17 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R18 | 1-216-822-11 | s | METAL, CHIP 1.2K 5% 1/16W |

(EN-98/98P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R25 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R26 | 1-216-817-11 | s | METAL, CHIP 470 5% 1/16W |
| R27 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R28 | 1-216-827-11 | s | METAL, CHIP 3.3K 5% 1/16W |
| R29 | 1-216-823-11 | s | METAL, CHIP 1.5K 5% 1/16W |
| R30 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R31 | 1-216-830-11 | s | METAL, CHIP 5.6K 5% 1/16W |
| R32 | 1-216-830-11 | s | METAL, CHIP 5.6K 5% 1/16W |
| R76 | 1-216-838-11 | s | METAL, CHIP 27K 5% 1/16W |
| R77 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R79 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R81 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R82 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R83 | 1-216-823-11 | s | METAL, CHIP 1.5K 5% 1/16W |
| R84 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R85 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R87 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R88 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R89 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R90 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R91 | 1-216-823-11 | s | METAL, CHIP 1.5K 5% 1/16W |
| R92 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R93 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R95 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R97 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R98 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R99 | 1-216-823-11 | s | METAL, CHIP 1.5K 5% 1/16W |
| R100 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R101 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R102 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R103 | 1-216-822-11 | s | METAL, CHIP 1.2K 5% 1/16W |
| R104 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R105 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R106 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R107 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R108 | 1-216-827-11 | s | METAL, CHIP 3.3K 5% 1/16W |
| R109 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R110 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R111 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R112 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R113 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R114 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R115 | 1-216-835-11 | s | METAL, CHIP 15K 5% 1/16W [for CMA-999] |
| R116 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W [for CMA-999] |
| R117 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R118 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R119 | 1-216-835-11 | s | METAL, CHIP 15K 5% 1/16W [for CMA-999] |
| R120 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W [for CMA-999] |
| R121 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R122 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |

(EN-98/98P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R123 | 1-216-828-11 | s | METAL, CHIP 3.9K 5% 1/16W [for CMA-999] |
| R124 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W [for CMA-999] |
| R125 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W [for CMA-999] |
| R126 | 1-216-811-11 | s | METAL, CHIP 150 5% 1/16W [for CMA-999] |
| R127 | 1-216-835-11 | s | METAL, CHIP 15K 5% 1/16W [for CMA-999] |
| R128 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W [for CMA-999] |
| R129 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R130 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R131 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R132 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R133 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R134 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999] |
| R134 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W [for CMA-999P] |
| R135 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R136 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R137 | 1-216-857-11 | s | METAL, CHIP 1M 5% 1/16W [for CMA-999] |
| R138 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R139 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R140 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R142 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R143 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R144 | 1-216-827-11 | s | METAL, CHIP 3.3K 5% 1/16W |
| R145 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R146 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R147 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W [for CMA-999P] |
| R148 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W [for CMA-999] |
| R150 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R151 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R152 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W |
| R153 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R154 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R155 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R156 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R158 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R159 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W |
| R160 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R161 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R162 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R163 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R164 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R165 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W |
| R166 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R167 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R168 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R181 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R182 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R183 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |

(EN-98/98P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R184 | 1-216-624-11 | s | METAL, CHIP 75 0.5% 1/10W |
| R185 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R190 | 1-216-817-11 | s | METAL, CHIP 470 5% 1/16W |
| R201 | 1-216-831-11 | s | METAL, CHIP 6.8K 5% 1/16W |
| R202 | 1-216-834-11 | s | METAL, CHIP 12K 5% 1/16W |
| R203 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| R206 | 1-216-834-11 | s | METAL, CHIP 12K 5% 1/16W |
| R207 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R208 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R210 | 1-216-831-11 | s | METAL, CHIP 6.8K 5% 1/16W |
| R211 | 1-216-834-11 | s | METAL, CHIP 12K 5% 1/16W |
| R212 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| R215 | 1-216-834-11 | s | METAL, CHIP 12K 5% 1/16W |
| R216 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R218 | 1-216-831-11 | s | METAL, CHIP 6.8K 5% 1/16W |
| R219 | 1-216-834-11 | s | METAL, CHIP 12K 5% 1/16W |
| R220 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| R223 | 1-216-834-11 | s | METAL, CHIP 12K 5% 1/16W |
| R224 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R225 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R250 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R251 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R252 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R253 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| R254 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R255 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| R256 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R257 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R260 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R261 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W |
| RV1 | 1-238-088-11 | s | RES, ADJ, CERMET 2.2K |
| RV3 | 1-238-088-11 | s | RES, ADJ, CERMET 2.2K |
| RV5 | 1-238-089-11 | s | RES, ADJ CERMET 4.7K |
| RV6 | 1-238-087-11 | s | RES, ADJ CERMET 1K |
| RV7 | 1-238-087-11 | s | RES, ADJ CERMET 1K |
| RV8 | 1-238-087-11 | s | RES, ADJ CERMET 1K |
| RV9 | 1-238-088-11 | s | RES, ADJ, CERMET 2.2K |
| RV10 | 1-238-088-11 | s | RES, ADJ, CERMET 2.2K |
| RV11 | 1-238-240-11 | s | RES, ADJ CERMET 220 [for CMA-999] |
| RV12 | 1-238-088-11 | s | RES, ADJ, CERMET 2.2K |
| RV13 | 1-238-088-11 | s | RES, ADJ, CERMET 2.2K |
| RV20 | 1-238-090-11 | s | RES, ADJ CERMET 10K |
| RV21 | 1-238-090-11 | s | RES, ADJ CERMET 10K |
| RV22 | 1-238-090-11 | s | RES, ADJ CERMET 10K |
| RV23 | 1-238-089-11 | s | RES, ADJ CERMET 4.7K |
| RV24 | 1-238-089-11 | s | RES, ADJ CERMET 4.7K |
| RV25 | 1-238-089-11 | s | RES, ADJ CERMET 4.7K |
| RV30 | 1-238-089-11 | s | RES, ADJ CERMET 4.7K |
| S1 | 1-571-120-11 | s | SWITCH, SLIDE [for CMA-999] |
| S2 | 1-571-120-11 | s | SWITCH, SLIDE |

SG-185/185P BOARD

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| 1pc | A-7515-396-A | o | MOUNTED CIRCUIT BOARD, SG-185 [for CMA-999] |
| 1pc | A-7515-397-A | o | MOUNTED CIRCUIT BOARD, SG-185P [for CMA-999P] |
| 3pcs | 2-125-904-01 | o | SHEET, INSULATING |
| C1 | 1-135-159-21 | s | TANTALUM, CHIP 10uF 10% 20V |
| C2 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C3 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C4 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C5 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C20 | 1-163-110-00 | s | CERAMIC, CHIP 51PF 5% 50V [for CMA-999] |
| C20 | 1-163-241-11 | s | CERAMIC, CHIP 39PF 5% 50V [for CMA-999P] |
| C23 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C24 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C30 | 1-135-157-21 | s | TANTALUM, CHIP 10uF 10% 6.3V |
| C31 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C32 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C33 | 1-162-927-11 | s | CERAMIC, CHIP 100PF 5% 50V |
| C34 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C35 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C36 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C37 | 1-163-275-11 | s | CERAMIC 0.001uF 5% 50V |
| C38 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C39 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C41 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C42 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C50 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C51 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C52 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C53 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C54 | 1-162-964-11 | s | CERAMIC 0.001uF 10% 50V |
| C55 | 1-164-156-11 | s | CERAMIC 0.1uF 25V [for CMA-999] |
| C56 | 1-162-964-11 | s | CERAMIC 0.001uF 10% 50V |
| C57 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C60 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C62 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| C63 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C64 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C65 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C66 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C67 | 1-135-156-21 | s | TANTALUM, CHIP 6.8uF 10% 6.3V |
| C68 | 1-135-166-21 | s | TANTALUM, CHIP 47uF 10% 10V |
| C69 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C70 | 1-162-918-11 | s | CERAMIC, CHIP 18PF 5% 50V |
| C71 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C72 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C73 | 1-135-156-21 | s | TANTALUM, CHIP 6.8uF 10% 6.3V |
| C82 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C83 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C84 | 1-126-395-11 | s | ELECT, CHIP 22uF 20% 16V |
| C85 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C86 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C87 | 1-135-091-00 | s | TANTALUN, CHIP 1uF 10% 16V |
| C88 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C89 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C90 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C91 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |

(SG-185/185P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| C92 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V [for CMA-999P] |
| C100 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C101 | 1-135-161-21 | s | TANTALUM, CHIP 22uF 10% 10V |
| C104 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C105 | 1-162-913-11 | s | CERAMIC 8PF 0.5PF 50V [for CMA-999P] |
| C106 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C110 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C111 | 1-135-157-21 | s | TANTALUM, CHIP 10uF 10% 6.3V |
| C113 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C114 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C119 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C120 | 1-126-395-11 | s | ELECT, CHIP 22uF 20% 16V |
| C121 | 1-128-006-11 | s | ELECT 4.7uF 20% 25V |
| C122 | 1-126-204-11 | s | ELECT 47uF 20% 16V |
| C123 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C124 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C125 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C126 | 1-128-004-11 | s | ELECT 10uF 20% 16V |
| C127 | 1-164-156-11 | s | CERAMIC 0.1uF 25V |
| C128 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C129 | 1-162-913-11 | s | CERAMIC 8PF 0.5PF 50V [for CMA-999P] |
| C203 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C204 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C210 | 1-162-927-11 | s | CERAMIC, CHIP 100PF 5% 50V |
| C211 | 1-135-070-00 | s | TANTALUM, CHIP 0.1uF 10% 35V |
| C212 | 1-135-149-21 | s | TANTALUM, CHIP 2.2uF 10% 10V |
| C213 | 1-162-964-11 | s | CERAMIC 0.001uF 10% 50V |
| C214 | 1-162-970-11 | s | CERAMIC, CHIP 0.01uF 10% 25V |
| C215 | 1-135-149-21 | s | TANTALUM, CHIP 2.2uF 10% 10V |
| C216 | 1-162-919-11 | s | CERAMIC, CHIP 22PF 5% 50V |
| CN1 | 1-566-527-11 | s | CONNECTOR, FPC (ZIF) 11P |
| CN2 | 1-566-527-11 | s | CONNECTOR, FPC (ZIF) 11P |
| CN3 | 1-691-201-11 | s | CONNECTOR, FFC 12P |
| CN4 | 1-691-200-11 | s | CONNECTOR, FFC 10P |
| CT101 | 1-141-437-11 | s | CAP, VAR, TRIMMER (CHIP TYPE) |
| CT102 | 1-141-437-11 | s | CAP, VAR, TRIMMER (CHIP TYPE) |
| D5 | 8-719-800-76 | s | DIODE 1SS226 |
| D6 | 8-719-988-37 | s | DIODE HVU350F |
| D7 | 8-719-988-37 | s | DIODE HVU350F |
| D8 | 8-719-988-37 | s | DIODE HVU350F |
| D9 | 8-719-800-76 | s | DIODE 1SS226 |
| D10 | 8-719-988-37 | s | DIODE HVU350F |
| FL1 | 1-239-212-21 | s | FILTER, BAND PASS [for CMA-999] |
| FL1 | 1-239-211-21 | s | FILTER, BAND PASS [for CMA-999P] |
| FL2 | 1-236-757-21 | s | FILTER, LOW PASS (C) [for CMA-999] |
| FL2 | 1-236-848-21 | s | FILTER, LOW PASS [for CMA-999P] |
| IC1 | 8-759-710-82 | s | IC NJM2406F |
| IC2 | 8-759-038-46 | s | IC SC7S00F |
| IC3 | 8-759-208-11 | s | IC TC4053BF |
| IC4 | 8-759-926-24 | s | IC TC74HC164NS |
| IC5 | 8-759-009-51 | s | IC MC14538BF |
| IC6 | 8-759-902-88 | s | IC SN74LS123NS |
| IC7 | 8-759-100-94 | s | IC UPC358G2 |
| IC8 | 8-759-208-11 | s | IC TC4053BF |
| IC9 | 8-759-711-50 | s | IC NJU7022M |

(SG-185/185P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| IC14 | 8-752-335-47 | s | IC CXD1216M |
| IC15 | 8-752-332-67 | s | IC CXD1217M |
| IC16 | 8-759-243-19 | s | IC TC7SU04F |
| IC17 | 8-759-234-20 | s | IC TC7S08F |
| IC18 | 8-759-234-13 | s | IC TC4S30F |
| IC20 | 8-759-234-13 | s | IC TC4S30F |
| IC21 | 8-759-243-19 | s | IC TC7SU04F |
| IC22 | 8-759-038-46 | s | IC SC7S00F |
| JR2 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR3 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR4 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR5 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR6 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR7 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR8 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR9 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR10 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR11 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| JR16 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR21 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999] |
| JR22 | 1-216-864-11 | s | METAL, CHIP 0 5% 1/16W [for CMA-999P] |
| L1 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L2 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L5 | 1-412-010-41 | s | INDUCTOR, CHIP 22uH |
| L6 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L7 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L8 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L9 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L10 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L13 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L15 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L17 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| L18 | 1-412-030-11 | s | INDUCTOR CHIP 22uH |
| PU1 | 1-466-633-11 | s | CONVERTER UNIT, DC-DC |
| Q12 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q13 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q14 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q15 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q16 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q20 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q21 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q22 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |
| Q23 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 [for CMA-999] |
| Q24 | 8-729-905-23 | s | TRANSISTOR 2SA1576R [for CMA-999] |
| Q28 | 8-729-120-28 | s | TRANSISTOR 2SC1623-L5L6 |

(SG-185/185P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| Q29 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q30 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| Q31 | 8-729-905-23 | s | TRANSISTOR 2SA1576R |
| R31 | 1-218-721-11 | s | METAL 16K 0.50% 1/16W |
| R32 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R33 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R34 | 1-216-813-11 | s | METAL, CHIP 220 5% 1/16W |
| R35 | 1-216-827-11 | s | METAL, CHIP 3.3K 5% 1/16W |
| R36 | 1-216-848-11 | s | METAL, CHIP 180K 5% 1/16W |
| R37 | 1-216-822-11 | s | METAL, CHIP 1.2K 5% 1/16W |
| R38 | 1-216-823-11 | s | METAL, CHIP 1.5K 5% 1/16W |
| R39 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R40 | 1-216-827-11 | s | METAL, CHIP 3.3K 5% 1/16W |
| R41 | 1-216-826-11 | s | METAL, CHIP 2.7K 5% 1/16W |
| R42 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W |
| R51 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R52 | 1-216-843-11 | s | METAL, CHIP 68K 5% 1/16W |
| R53 | 1-216-849-11 | s | METAL, CHIP 220K 5% 1/16W |
| R54 | 1-216-835-11 | s | METAL, CHIP 15K 5% 1/16W |
| R55 | 1-216-849-11 | s | METAL, CHIP 220K 5% 1/16W |
| R56 | 1-216-687-11 | s | METAL, CHIP 33K 0.5% 1/10W |
| R57 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R60 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W [for CMA-999] |
| R61 | 1-216-839-11 | s | METAL, CHIP 33K 5% 1/16W [for CMA-999] |
| R62 | 1-216-857-11 | s | METAL, CHIP 1M 5% 1/16W |
| R63 | 1-216-857-11 | s | METAL, CHIP 1M 5% 1/16W |
| R70 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R72 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R73 | 1-216-686-11 | s | METAL, CHIP 30K 0.5% 1/10W |
| R74 | 1-216-675-11 | s | METAL, CHIP 10K 0.5% 1/10W |
| R75 | 1-216-675-11 | s | METAL, CHIP 10K 0.5% 1/10W |
| R76 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R78 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R80 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R81 | 1-218-733-11 | s | METAL 51K 0.50% 1/16W |
| R82 | 1-216-685-11 | s | METAL, CHIP 27K 0.5% 1/10W |
| R83 | 1-216-809-11 | s | METAL, CHIP 100 5% 1/16W |
| R91 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R92 | 1-216-839-11 | s | METAL, CHIP 33K 5% 1/16W |
| R93 | 1-216-831-11 | s | METAL, CHIP 6.8K 5% 1/16W |
| R94 | 1-216-827-11 | s | METAL, CHIP 3.3K 5% 1/16W |
| R95 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R96 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R97 | 1-216-651-11 | s | METAL, CHIP 1K 0.5% 1/10W |
| R98 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R99 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R100 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R101 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R102 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R103 | 1-216-825-11 | s | METAL, CHIP 2.2K 5% 1/16W |
| R104 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R105 | 1-216-823-11 | s | METAL, CHIP 1.5K 5% 1/16W |
| R106 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W [for CMA-999P] |
| R107 | 1-216-839-11 | s | METAL, CHIP 33K 5% 1/16W [for CMA-999P] |
| R110 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |

(SG-185/185P BOARD)

| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| R113 | 1-216-841-11 | s | METAL, CHIP 47K 5% 1/16W [for CMA-999] |
| R114 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W [for CMA-999] |
| R115 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W [for CMA-999] |
| R121 | 1-216-837-11 | s | METAL, CHIP 22K 5% 1/16W |
| R122 | 1-216-841-11 | s | METAL, CHIP 47K 5% 1/16W |
| R123 | 1-216-833-11 | s | METAL, CHIP 10K 5% 1/16W |
| R124 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R125 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R126 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R127 | 1-216-857-11 | s | METAL, CHIP 1M 5% 1/16W |
| R206 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R207 | 1-216-857-11 | s | METAL, CHIP 1M 5% 1/16W |
| R210 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R211 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R212 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R213 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R214 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R215 | 1-216-821-11 | s | METAL, CHIP 1K 5% 1/16W |
| R217 | 1-216-845-11 | s | METAL, CHIP 100K 5% 1/16W |
| R218 | 1-216-857-11 | s | METAL, CHIP 1M 5% 1/16W |
| R219 | 1-216-844-11 | s | METAL, CHIP 82K 5% 1/16W |
| R220 | 1-216-835-11 | s | METAL, CHIP 15K 5% 1/16W |
| R221 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R222 | 1-216-843-11 | s | METAL, CHIP 68K 5% 1/16W |
| R223 | 1-216-849-11 | s | METAL, CHIP 220K 5% 1/16W |
| R224 | 1-216-835-11 | s | METAL, CHIP 15K 5% 1/16W |
| R225 | 1-216-829-11 | s | METAL, CHIP 4.7K 5% 1/16W |
| R226 | 1-216-295-00 | s | METAL, CHIP 0 5% 1/10W |
| R230 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| R231 | 1-216-819-11 | s | METAL, CHIP 680 5% 1/16W |
| RV1 | 1-238-091-11 | s | RES, ADJ CERMET 22K |
| RV2 | 1-238-092-11 | s | RES, ADJ CERMET 47K [for CMA-999] |
| RV3 | 1-238-090-11 | s | RES, ADJ CERMET 10K [for CMA-999P] |
| X1 | 1-579-726-11 | s | CRYSTAL 14.318MHz [for CMA-999] |
| X1 | 1-579-519-21 | s | VIBRATOR, CRYSTAL [for CMA-999P] |
| X2 | 1-579-726-11 | s | CRYSTAL 14.318MHz [for CMA-999] |
| X2 | 1-567-733-11 | s | VIBRATOR, CRYSTAL [for CMA-999P] |

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FRAME
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| Ref. No. or Q'ty | Part No. | SP | Description |
|---|---|---|---|
| CN3 | 1-562-381-00 | s | CONNECTOR, 12P MALE "DC IN/SYNC/VIDEO" |
| CN4 | 1-565-301-11 | s | CONNECTOR, 4P FEMALE "Y/C" |
| CN4 | 1-580-090-11 | s | SOCKET, D-SUB 9P FEMALE "RGB/SYNC" |
| CN5 | 1-562-221-31 | s | RECEPTACLE, 12P FEMALE "CAMERA" |

# SECTION E
# CHANGED PARTS

NOTE: The numbers identified by marking with ) are matching with each serial numbers.
See the table matched with each serial numbers.

XC-999/999P

110) Serial No. 10471 and higher(for XC-999)
110) Serial No. 10111 and higher(for XC-999P)
112) Serial No. 10671 and higher(for XC-999)
112) Serial No. 10911 and higher(for XC-999P)
210) Serial No. 12911 and higher(for XC-999P)

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EN-97/97P BOARD (for XC-999/999P)
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| | | |
|---|---|---|
| OLD) | R602 | 1-218-947-11 s METAL, CHIP 330 5% 1/16W (for XC-999P) |
| 110) | R602 | 1-218-945-11 s METAL, CHIP 220 5% 1/16W (for XC-999P) |
| OLD) | R624 | 1-218-953-11 s METAL, CHIP 1K 5% 1/16W |
| 110) | R624 | 1-218-962-11 s METAL, CHIP 5.6K 5% 1/16W |
| OLD) | R644 | 1-218-971-11 s METAL, CHIP 33K 5% 1/16W |
| 110) | R644 | 1-218-967-11 s METAL 15K 5% 1/16W |
| OLD) | R645 | 1-218-955-11 s METAL, CHIP 1.5K 5% 1/16W |
| 110) | R645 | 1-218-967-11 s METAL 15K 5% 1/16W |
| OLD) | R668 | 1-218-977-11 s METAL, CHIP 100K 5% 1/16W |
| 110) | R668 | 1-218-976-11 s METAL 82K 5% 1/16W |
| OLD) | R671 | 1-218-982-11 s METAL, CHIP 270K 5% 1/16W |
| 110) | R671 | 1-218-989-11 s METAL 1M 5% 1/16W |
| OLD) | RV608 | 1-241-608-11 s RES, ADJ, METAL 4.7K |
| 110) | RV608 | 1-241-609-11 s RES, ADJ CERMET 10K |

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TG-89/89P BOARD (for XC-999/999P)
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| | | |
|---|---|---|
| OLD) | R79 | 1-218-971-11 s METAL, CHIP 33K 5% 1/16W (for XC-999P) |
| 210) | R79 | 1-218-969-11 s METAL, CHIP 22K 5% 1/16W (for XC-999P) |

CMA-999/999P

110) Serial No. 10351 and higher(for CMA-999)
111) Serial No. 10651 and higher(for CMA-999)
111) Serial No. 10431 and higher(for CMA-999P)
112) Serial No. 10801 and higher(for CMA-999)
112) Serial No. 10531 and higher(for CMA-999P)

201) Serial No. 10951 and higher(for CMA-999)
201) Serial No. 10581 and higher(for CMA-999P)
202) Serial No. 11201 and higher(for CMA-999)
202) Serial No. 10581 and higher(for CMA-999P)
203) Serial No. 11401 and higher(for CMA-999)

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EN-98/98P BOARD (for CMA-999/999P)
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| | | |
|---|---|---|
| OLD) | JR4 | 1-216-864-11 s METAL, CHIP 0 5% 1/16W |
| 202) | JR4 | DELETED. |
| OLD) | R261 | NOT IN USE. |
| 202) | R261 | 1-216-864-11 s METAL, CHIP 0 5% 1/16W |
| OLD) | S2 | NOT IN USE. |
| 202) | S2 | 1-571-120-11 s SWITCH, SLIDE |

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SG-185/185 BOARD (for CMA-999/999P)
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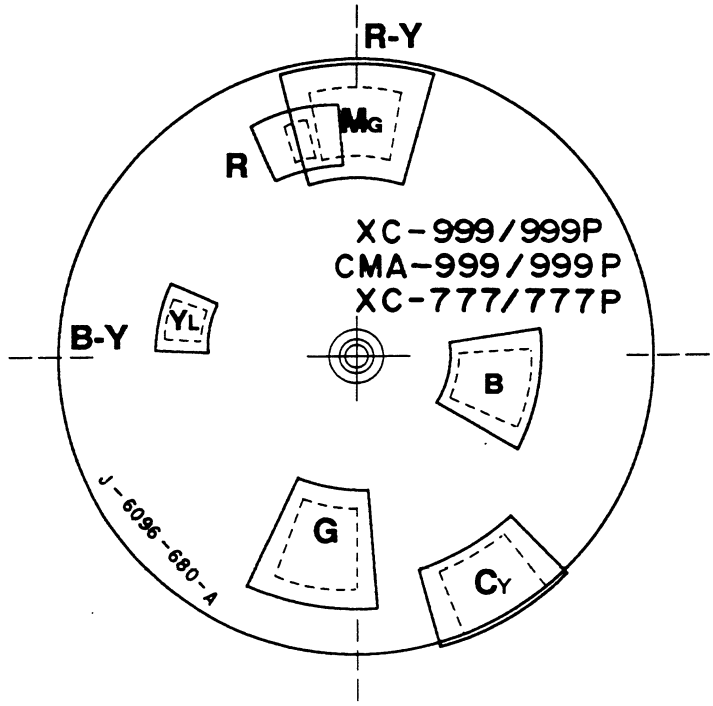
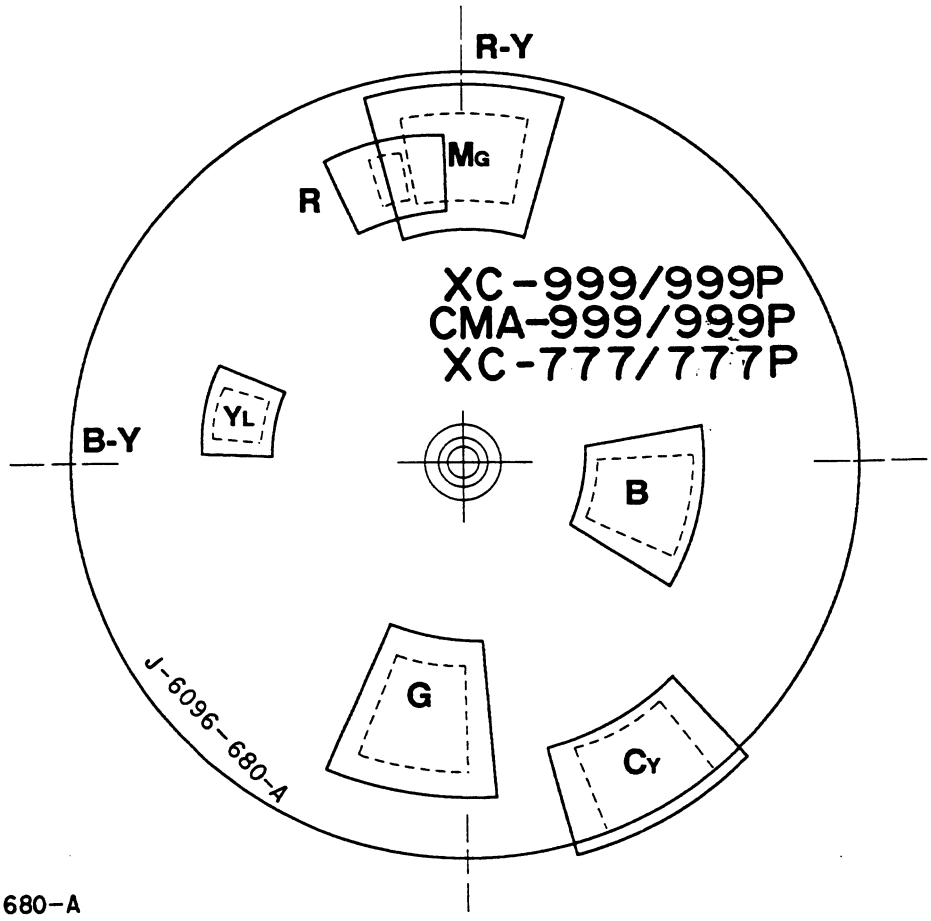
| | | |
|---|---|---|
| OLD) | 3pcs | NOT IN USE. |
| 201) | 3pcs | 2-125-904-01 o SHEET, INSULATING |
| OLD) | C37 | 1-163-137-00 s CERAMIC, CHIP 680PF 5% 50V |
| 111) | C37 | 1-163-275-11 s CERAMIC 0.001uF 5% 50V |
| OLD) | C105 | 1-162-913-11 s CERAMIC, CHIP 8PF 0.5PF 50V (for CMA-999) |
| 203) | C105 | DELETED. (FOR CMA-999) |
| OLD) | C129 | 1-162-912-11 s CERAMIC, CHIP 7PF 0.5PF 50V |
| 203) | C129 | DELETED. (FOR CMA-999) |
| 112) | C129 | 1-162-913-11 s CERAMIC 8PF 0.5PF 50V (for CMA-999P) |
| OLD) | JR1 | 1-216-864-11 s METAL, CHIP 0 5% 1/16W (for CMA-999) |
| 110) | JR1 | DELETED. (FOR CMA-999) |
| OLD) | JR16 | NOT IN USE. (FOR CMA-999) |
| 110) | JR16 | 1-216-864-11 s METAL, CHIP 0 5% 1/16W (for CMA-999) |
| OLD) | R56 | 1-216-692-11 s METAL, CHIP 51K 0.5% 1/10W |
| 111) | R56 | 1-216-687-11 s METAL, CHIP 33K 0.5% 1/10W |
| OLD) | R216 | 1-216-857-11 s METAL, CHIP 1M 5% 1/16W |
| 112) | R216 | DELETED. |
| OLD) | R226 | 1-216-296-11 s METAL, CHIP 0 5% 1/8W |
| 112) | R226 | 1-216-295-00 s METAL, CHIP 0 5% 1/10W |
| OLD) | R230 | NOT IN USE. |
| 112) | R230 | 1-216-819-11 s METAL, CHIP 680 5% 1/16W |
| OLD) | R231 | NOT IN USE. |
| 112) | R231 | 1-216-819-11 s METAL, CHIP 680 5% 1/16W |
| OLD) | X1 | 1-577-153-11 s CRYSTAL 14.31818MHz (for CMA-999) |
| 203) | X1 | 1-579-726-11 s CRYSTAL 14.318MHz (for CMA-999) |
| OLD) | X2 | 1-577-153-11 s CRYSTAL 14.31818MHz (for CMA-999) |
| 203) | X2 | 1-579-726-11 s CRYSTAL 14.318MHz (for CMA-999) |


R-Y
MG
R
XC-999/999P
CMA-999/999P
XC-777/777P
B-Y
YL
B
J-6096-680-A
G
CY


R-Y
MG
R
XC-999/999P
CMA-999/999P
XC-777/777P
B-Y
YL
B
J-6096-680-A
G
CY

J-6096-680-A